HEALTH ASPECTS OF PESTICIDES

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ENVIRONMENTAL PROTECTION AGENCY

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HEALTH ASPECTS OF PESTICIDES ABSTRACT BULLETIN is a monthly publication of the Division of Pesticide Community Studies of the Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides on humans. The publication represents a monthly review of more than 1150 domestic and foreign journals. Subjects and authors of abstracted articles are cross-referenced in an annual index issue. Reprint requests should be directed to the author of the complete article.

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72-2268. Curry, A. S. (Cen. Res. Estab., Aldermaston, England). **Pesticides and herbicides.** *In: Advances in Forensic and Clinical Toxicology. Chemical Rubber Co., Cleveland, 1972, pp. 167-171.* (77 references)

Information pertinent to the forensic toxicologist is presented discussing metabolism, clinical effects, post mortem effects, and methods of analysis of many pesticides and herbicides. Organochlorines can be detected in tissue using direct extraction with petroleum ether, followed by electron capture gas chromatography. Studies have indicated that DDT is converted to DDD (TDE) post mortem. However, because it is very temperature dependent, this conversion is not extremely useful for determining time of death. Paraquat, an herbicide which causes lung damage several days after ingestion, can be detected in small quantities of urine long after ingestion. Other drugs are often no longer detectable when death occurs. Organophosphates are analyzed by TLC or by gas chromatography with specific phosphorus detectors. The latter method has on occasion given apparent negative results because of a reaction of the pesticides with material extracted from the tissue. ChE levels are also a useful indicators for the forensic toxicologist.

72-2269. Curry, A. S. (Cen. Res. Estab., Aldermaston, England). **Thallium.** *In: Advances in Forensic and Clinical Toxicology. Chemical Rubber Co., Cleveland, 1972, pp. 195-197.* (26 references)

Thallium poisoning may not be detected by even the most experienced physician because it is rarely seen relative to the numerous natural illnesses. Symptoms most often observed are extreme sensitivity of the lower extremities to touch and, if death occurs later than the 14th day post ingestion, loss of hair. Urinary excretion of the thallium is slow and has been increased by administering diethyldithiocarbamate. Of the tests for thallium, the colorimetric methods are probably most widely used. "Normal" tissue levels of thallium determined by mass spectroscopy have been found to be extremely low. In thallium poisoning, all tissue shows a large increase in thallium, although not necessarily one related to dose or effects.

72-2270. Deichmann, W. B. (Univ. of Miami, Sch. of Med., Miami, FL). **The debate on DDT.** *Arch. Toxikol. 29(1): 1-27; 1972.* (27 references)

The paper reviews the early toxicologic and pharmacologic studies carried out by the author and his associates from 1943 to 1947, which were largely responsible for launching DDT as an agent for the control of typhus, malaria, yellow fever, and related vector-borne diseases. After reviewing recent studies conducted at the University of Miami, which dealt with organochlorine pesticides in human tissues, the tumorigenicity of aldrin, dieldrin and endrin (rat), six-generation mouse and three-generation dog reproduction studies, synergism of DDT and aldrin (dog), and the fate of DDT and aldrin during a period of severe starvation (rat), it is pointed out that it is primarily the overuse and misuse of DDT in pest control that have caused the pollution in our ecology. It is emphasized that the requirements for pest control differ the world over and that it must therefore be left to the national regulatory agencies to legislate the safe use of DDT and related pesticides. It is recommended that future human and animal studies with DDT and its derivatives give consideration to: the balance and metabolism of the various hormones; reproduction (estrus, libido, mammary development, milk production); hepatic microsomal enzyme activities; cancer prevention and cancer production; excessive body weight changes induced by disease, unbalanced diet or starvation; and the effects of DDT and its derivatives when absorbed in combination with other related and even unrelated compounds. (Author abstract by permission)

72-2271. Katar'yan, B. T. (Inst. of Microbiol., Acad. of Sci., Armenian SSR). **Rasteniya-indikatory dlya izyskaniya mikrobnykh gerbitsidov. [Plant indicators for finding microbial herbicides.]** *Biol. Zh. Arm. 25(3): 20-24; 1972.* (9 references) (Russian)

Results are presented of a study of weeds similar to cultivated plants in the percentage of seed germination, growth energy, and resistance to microbial infections. These weeds can be used as indicator cultures for the preliminary isolation of microorganisms with herbicidal activity. Only 12% of the 237 weed species studied are recommended as indicator cultures. A table of species which can be used to characterize the spectrum of microbial herbicidal activity in reference to several plant families is given. The seed germination and growth energy of weeds were also compared with those of wheat, pea, and cabbage seeds.

72-2272. Anonymous. **Agricultural chemical to replace organic mercury.** *Chem. Econ. & Eng. Rev. 4(6): 60; 1972.*

Two companies, one Swedish and one Japanese, have agreed to cooperate in manufacture and distribution of a new seed disinfectant which is expected to supplant organic mercurial agents. The compound, an alkyl amine derivative prepared from octamethylene diamine, is reportedly effective against rice blight, has low initial toxicity, and offers no threat of residues. Interest in the new product is great, as it offers the hope of reducing the mercury contamination of soils and waters which seems so troublesome at present. In addition to agricultural uses, the new compound may have industrial applications as a slimicide and antifouling agent.

72-2273. Neumann, H. G. (Inst. fuer Pharmakol. und Toxikol.,Univ. Wuerzburg, Wurzburg, Germany). **DDT in der Umwelt:Gefahr fuer unsere Gesundheit? [DDT in the environment: a threat to human health?]** *Chem. Unserer Zeit 6(3): 82-86; 1972.* (2 references) (German)

To estimate DDT's threat to health, it is necessary to know something about its action mechanism in various species. The differential toxicity of DDT is due to differences in biotransformation and excretion of DDE, rather than to differences in toxic action mechanism. In man, a steady DDT level in the body fat becomes established after continuous DDT ingestion; thus the more DDT ingested, the more is excreted. For this reason, the levels of chronic DDT ingestion which would cause clinical intoxication symptoms are far below those likely to be encountered by man, other than through gross misuse of the chemical. The carcinogenic and mutagenic potentials of DDT are more difficult to determine. Up to the present time, there is no evidence indicating that any delayed threat to man exists. In view of these findings and the fact that DDT is presently indispensable for disease vector control, its limited, cautious use is necessary. Efforts toward the development of nonchemical insect control means are expected to continue.

72-2274. Anonymous. **Pesticides '72. (Part I.)** *Chem. Week 110(25): 33-36; 1972.*

This report on the pesticide industry includes a list of manufacturers with addresses, a list of products, estimated production and related information, and an analysis of the status of the industry. Although pesticide sales have not grown in the last three years, manufacturers expect the industry's growth rate to increase, perhaps to 10%, by 1980. Concern over the environment has resulted in cancellation of numerous pesticide registrations, particularly those of insecticides. In contrast to its past response to criticism, the industry is now making efforts to achieve pest control, using all known methods, in order to minimize ill effects. The new approach is expected to be costly, but a continued demand is seen for pesticides.

72-2275. Anonymous. **Pesticides '72. (Part 2.)** *Chem. Week 111(4): 18-46; 1972.*

The status of pesticide production in 1972 is reviewed (see Abstract No. 72-2274).New approaches have been developed due to high cost of research and stricter government control. One of these is the biodynamic approach which relates pesticides to the physiological processes of insects and weeds. This approach may prompt the development of antimetabolites to reduce the insect's feeding impulse, to delay pupation, or to disrupt the hormone balance for inhibiting metamorphosis. Development of plant varieties resistant to pests is another avenue of investigation as are sex attractants, useful in monitoring pests in time to take countermeasures. A number of new regulations and some revisions which would be of assistance to industry in further productivity are listed.

72-2276. Getzendaner, M. E. (Residue Res., Ag-Organics Dept., Dow Chemical U.S.A., Midland, MI 48640). **Answering critical questions about residues of agricultural chemicals.** *Down Earth 28(1): 24-29; 1972.* (5 references)

Practical problems encountered by chemists in providing residue data for registration of agricultural chemicals in the USA are discussed. The residue, when present at the levels found, must be proven safe for animal or human consumption and a tolerance established. Metabolic studies are carried out by radioactive labeling which traces the compound through the biological system and in the environment to determine its breakdown or movement. Normal conditions of use are simulated. The exact formulations under which the product is to be sold are required and must be stated on the label. Residue samples of plants must represent the major geographical areas permitted by the label, in which the crop is important, as well as major differences in cultural practices which might have an effect on residue levels. Residue determination comprises the establishment of a lower level of sensitivity, adequate recovery controls, determination of both free and bound compounds, interference of other pesticides, and valid, reproducible methods of analysis. The problems arising out of the various steps are compounded by legislative changes which are subject to new ideas with respect to pesticides.

72-2277. Lesnikov, L. A. (State Sci. Res. Inst. of Lake and River Fish Farming, Leningrad, USSR). **O razdelenii pestitsidov na gruppy s tochki zreniya regulirovaniya ikh primeneniya i proizvodstva. [Group classification of pesticides in terms of their application and manufacturing regulations.]** *Eksp. Vod. Toksikol. Mater. Vses. Simp., 1st: 16-18; 1970.* (Russian)

A new group classification of pesticides on the basis of their hazards, from which application and manufacturing regulations can be derived, is proposed. The criteria are the ratio of the minimum effective to the maximum allowable concentration, the ratio of the rate of natural degradation to the time required for side-effects to develop, and the possibility of accumulation and transfer in the ecological system. Three different groups of pesticides can be distinguished on the basis of the above. The group of highly stable, accumulating pesticides, the use and massive production of which should be prohibited, includes DDT and BHC. The group of toxic non-accumulating pesticides with moderate stability includes methylmercaptophos, thiophos (parathion), Granosan, and heptachlor. The manufacturing of such pesticides should be subject to individual authorization, and special regulations should apply to storage and sale. Pesticides with low toxicity and stability, intended for massive use, are included in a third group (iron sulfate, sulfur). Such pesticides should be subject to the usual precautionary measures.

72-2278. Anonymous. **Simpozium: Vyyavleniye stepeni toksichnosti i mekhanizmov deystviya pestitsidov. Resheniye. [Symposium: Determination of the degree of toxicity and mechanism of action of pesticides. Conclusion.]** *Eksp. Vod. Toksikol. Mater. Vses. Simp., 1st: 39-46; 1970.* (Russian)

The symposium on water toxicology, held at Riga, Latvian SSR, May 12-15, 1970, was sponsored jointly by several branches of the Latvian and USSR Academies of Science, as well as the scientific council for the conservation of water resources of the USSR. Participants reported on research projects underway at 23 institutes in several Soviet republics. Current research is centered on perspectives and hazards and the mechanism of action of aquatic pesticides in the organism, population, and the ecosystem. Specific chemicals and their effects and accumulation in roe, larvae, fish, zooplankton, and phytoplankton were studied. Pesticide residues were determined in water and bottom samples from lakes and rivers. A method for forecasting the effects of pesticide residues on future generations of aquatic populations has been developed. Sanitary standards for pesticide residue are elaborated, and hygienic assessment of new pesticides and other products to be used in underwater construction is outlined. Assessments of the hazards of pesticides in water based on the LD50 values are inadequate.

72-2279. Goldman, M. I. (Wellesley Coll., Wellesley, MA). **Pollution: international complications.** *Environ. Aff. 2(1): 1-15; 1972.* (2 references)

The implications of pollution control are examined from an international perspective in connection with an United Nations' conference. Examples of different levels of control are cited in connection with the steel industry in Japan, the U.S., and in West Germany. The Aswan Dam is cited as an example of a technological achievement which has had serious environmental repercussions such as the spread of schistosomiasis, erosion of the Nile River bed, elimination of natural fertilization, and curtailment of nutrient flow to the sea. In developing countries, the effort to ban DDT, which has been instrumental in saving millions of lives by curbing malaria, causes great concern. The tropical countries, moreover, will encounter great difficulties in handling the control of pollution due to their climate. The more powerful countries, such as the USA, must set an example by banning the sale or purchase of materials or food issuing from sources where no pollution control exists. The reduction, if not the ban, of the manufacture of DDT may discourage the indiscriminate application of such pesticides.

72-2280. Provost, M. W. (Entomol. Res. Cent., Florida Div. of Health, P.O. Box 520, Vero Beach, FL 32960). **Environmental hazards in the control of disease vectors.** *Environ. Entomol. 1(3): 333-339; 1972.* (41 references)

The broadcast application of pesticides in disease vector control has resulted in severe environmental damage as well as development of resistance by some target organisms. Residual spraying of home interiors not only offers effective control of disease vectors and sanitary nuisances, but reduces environmental damage. Development of resistance by disease vectors has often followed massive agricultural pesticide use or larviciding in vector-infested areas. Space-spraying of dieldrin for tsetse control had disastrous results, but judicious brush-cutting and selective spraying of tree-trunk resting places of the flies appears to offer a better chance of success. The use of DDT for black fly control and thus reduction of onchocerciasis produced extensive changes in stream ecology, even destroying some of the most important predators of the black fly. Methoxychlor is much safer to stream life. Water management practices serve as alternative control methods against mosquito vectors of malaria, snail vectors of schistosomiasis, and the black fly. The integrated approach is obviously the path of the future in disease vector control.

72-2281. Bot, J. (Plant Protection Res. Inst., Pretoria, South Africa). **Pesticides and the safety period.** *Farming S. Afr. 46(5): 5,21; 1970.*

Government of South Africa requirements regarding the use of pesticides by the farmer are defined and explained. In order to protect the crops from excessive pesticide residues, a safety period is prescribed for each crop. This period is the interval between the last pesticide spraying or dusting of the crop and the day on which the harvest is begun. Directions for use and the safety period are printed on the label of each preparation. This information is required from any firm applying for registration of a preparation. In addition, the acceptable daily intake is determined by toxicologists and based upon the average total daily food intake of the population. The tolerance level is calculated by multiplying the safety factor by 100.

72-2282. Happ, G. W. (Univ. of Houston, Coll. of Law, Houston, TX). **Honeybees, pesticides and the law.** *Glean. Bee Cult. 99(9): 332-333; 1971.* (5 references)

"Actual damages" to bee colonies from pesticides can usually be recovered in court if a claimant can prove a particular land owner responsible for the application that caused the damages. When "loss of increase" and "anticipated amounts of honey to be produced" are grouped under "loss of use" and figures are obtained from past records, damages can be recovered and restitution claimed more easily. When pesticide damage is suspected, beekeepers are advised to act quickly to gather evidence in the form of photographs, testimony by a state inspector or graduate entomologist, and specimen analysis. A settlement made out of court is generally more desirable because of the expense of litigation.

72-2283. Anonymous. **[Pesticide pollution.]** *Hokenfu Zasshi (Jap. J. Pub. Health Nurse) 27: 48-49; 1971.* (3 references) (Japanese)

The number of known pesticides at present is approximately 5,600. Each is classified into one of four groups according to the degree of toxicity. Commonly known pesticides in reference to these categories are reviewed in a table. New products are required by a 1968 Japanese law to undergo more than three months of testing regarding their side effects in experimental animals. In actuality, the majority of products are tested for only three months. At present, tests are almost nonexistent for pesticides that are strongly suspected as carcinogenic and for various new products of chronic toxicity. Also the combined effects of two or more pesticides have not been thoroughly examined. Since the low-toxicity pesticides known at present are mostly high-priced, farmers are forced to use highly toxic, effective chemicals for economic reasons. Stricter control of highly toxic pesticide production and the further development of low-toxicity pesticides are desirable.

72-2284. Emara, A. M. (Ind. Med. and Occup. Dis. Dept., Cairo Univ., Egypt). **Occupational health problems in agricultural workers.** *J. Egypt. Med. Ass. 54: 311-321; 1971.* (10 references)

Although they are exposed to many hazards, agricultural workers have enjoyed few benefits from the progress of occupational medicine. Chemical factors pose a threat to the worker in the fields and with animals. Insecticides, fungicides, and herbicides contain chlorinated hydrocarbons, organic phosphates, carbamates, and substituted phenols, which may be harmful. The Expert Committee on Insecticides recommends that agricultural workers exposed to the organic phosphorus insecticides be tested regularly for their blood cholinesterase activity, which should not be allowed to fall much below the pre-exposure level. Other chemical hazards are metals such as lead and mercury and arsenic. The functions of an occupational health service that would aid the agricultural worker are enumerated.

72-2285. Bederka, Jr., J. P. (Fac. of Sci., Mahidol Univ., Bangkok, Thailand). **On the toxicity of our environment.** *J. Med. Ass. Thai. 54(5): 335-349; 1971.* (45 references)

Studies of residues of DDT, polychlorinated biphenyls (PCBs), and dieldrin in animal organs found the highest levels in adipose tissue, followed by the liver, and the brain, kidney, gonads, and skeletal muscle. PCBs as high as 17,000 ppm were found in tissues. DDT and its isomers in birds have been blamed for the gradual extinction of some of their species; in rats, estrogenic properties are apparent. Possible toxicities are connected with egg laying in birds since the egg seems to serve as a means for eliminating insecticides. DDT may also affect metabolic pathways involving calcium and estrogen as they are known to affect normal metabolism in the smooth endoplasmic reticulum of liver cells. The effects in human metabolism may influence the survival value. Transmission of pesticides via the food chain causes concern.

72-2286. Nishiuchi, K. (Agr. Chem. Insp. Sta. Min. Agr. and For., Koganei-shi, Tokyo, Japan). **[Toxicity of agricultural chemicals to fishes and its evaluation.]** *Kongetsu No Noyaku (Agr. Chem. Mon.) 16(8): 68-70; 1972.* (Japanese)

The official method of investigating and determining fish toxicity of agricultural chemicals (pesticides and their formulations) was published by the Japanese government. In principle, every pesticide and its formulation is applied to young carp of a standard length as an aqueous solution, for 48 hr, at a temperature of 20-28° C and its TLM obtained graphically. To evaluate actual toxicity in the fields, however, the following factors need consideration: difference of toxicities between the technical material and its formulation; difference between the theoretical and actual amounts of application; toxicity of ingredients other than the active ingredients; locality of application; toxicity in combination with other pesticides; and species differences in susceptibility of aquatic animals. Since consideration of all these factors is not practical, the government has adopted a system of "degree of dangerousness" for pesticides intended to be used in rice paddies. The final tests, based partially on TLM values, rank the chemicals in three categories, A, B, or C. Those ranked C, the most dangerous, require strict management and supervision to prevent dangerous pollution of river water.

72-2287. Bruce-Chwatt, L. J. (London Sch. of Hyg. and Trop. Med., London WC1E 7HT, England). **D.D.T.** *Lancet 7768: 131; 1972.*

In a Letter-to-the-Editor, it is pointed out that the ban by the U.S. EPA on the use of DDT, even though toxic effects in man have not been found, is causing concern among public health workers in tropical arthropod-borne diseases. Although the ban does not extend to the export of DDT, a number of mosquito-borne diseases have manifested a resurgence. Other, less persistent insecticides cannot be substituted by the poorer countries because of the comparatively high cost of malathion and propoxur. The costs calculated per person per annum for DDT, malathion, and propoxur are $0.21, $0.65, and $1.79, respectively. The reversal of the global malarial eradication programs in Ceylon, parts of the Indian subcontinent, Far East, Central and South America, and especially Africa, underline the potential seriousness of the situation.

72-2288. Anonymous. **Is DDT carcinogenic?** *Nature 237(5356): 420-421; 1972.*

There is no current evidence that DDT causes cancer in man. Animal studies reveal that liver lesions develop in certain strains of mice when fed 10-250 ppm DDT. However, the value of using mice for these studies is questionable; some strains used for testing DDT carcinogenicity have a tendency to form liver lesions more readily than other strains. Moreover, the type of lesion formed is not comparable to that found in man. Studies sponsored by the World Health Organization in many geographic locations have shown no evidence of cancer due to DDT. Studies at DDT manufacturing plants where workers' blood levels range between 50-100 times the "normal" levels show no evidence of an increased incidence of cancer; dieldrin also had negative results. Regardless of the high quantities of DDT stored in human fat in some populations, the cancer pattern has not changed. The reaction of British scientists to the ban by the United States is cool; they feel DDT is needed and should be used in countries where malaria is endemic.

72-2289. Hauge, S. (Papirindustriens Forskningsintitutt, Norway). **En orientering om P.C.B. [General facts on polychlorinated biphenyls.]** *Nor. Skogind. 26(7): 181-182; 1972.* (11 references) (Norwegian)

General problems of polychlorinated biphenyls (PCBs) are reviewed regarding their use in paper manufacturing. Polychlorinated biphenyls are highly stable, lipophilic substances, capable of accumulating in adipose tissues. While they have relatively low acute toxicity, they may interfere with the metabolism in the organism when present in concentrations above a certain limit. Investigations revealed PCB concentrations ranging from 0.01 to 3.0 mg/kg in various sea fishes. The PCB levels in muscles of carnivorous birds were 3.0 mg/kg. The lethal doses of PCBs in birds may range from several hundred to several thousand ppm and have caused thin, brittle eggshells. The minimum quantity detectable by gas-chromatographic method is 0.1 ppm.

72-2290. Lurie, J. B. (Klipfontein Org. Prod. Corp., Chloorkop, Transvaal, South Africa). **The stability of DDT.** *S. Afr. Med. J. 46(13): 370-371; 1972.* (7 references)

The DDT question is argued. Statements made by Rachel Carson regarding the deleterious effects of DDT are criticized for their lack of experimental evidence. The most important cumulative property (in cold blooded creatures) of DDT is the residues in the food chain. According to some authorities, the stability of DDT in the environment has not proven to be hazardous. The WHO has checked on the development of diseases which might be related to DDT residues, known to be carried in the bodies of the entire world population. However, this organization still allows the use of DDT to eradicate mosquitoes in malarial areas. No case of poisoning (or death) attributable to DDT, when used for the purpose for which it was designed, has been reported. The long-term effects have not as yet proven hazardous.

72-2291. Rainier-Pope, C. R. (16 Med. Cent., Joubert St., Vereeniging, Transvaal, South Africa). **The stability of DDT.** *S. Afr. Med. J. 46(20): 632; 1972.* (2 references)

In a Letter-to-the-Editor, Lurie's editorial on "The stability of DDT" (see Abstract No. 72-2290) is criticized for its defense of DDT persistence on the grounds that its effects on humans have not been proven. Although it is conceded that DDT has been instrumental in the prevention of many diseases spread by insect vectors, it has also been recognized that many insects have become resistant to it. Interference with the balance of nature may result from too concerted an effort to get rid of pests. However, it is a fact that DDT, or its degradation product DDE, kills animals or affects their natural functions (e.g. multiple congenital abnormalities in some birds).

72-2292. Adler, C. (New Sch. for Soc. Res., New York, NY 10011). **PCB's in the environment.** *Science 177(4044): 117-118; 1972.* (4 references)

In a Letter-to-the-Editor, the conclusion reached by Mosser et al. (see Abstract No. 72-1483) is refuted. Instead of their indusputable and obvious statement that PCBs may alter species composition, a plea is made for an estimate of the probability of ecological damage, which would be more meaningful. Since the writer states PCB distribution is tightly regulated, exception is also taken to the belief that PCBs could profoundly affect higher organisms. The defense by the original authors follows, reiterating the laboratory results and why the conclusions are vague: species alteration lacks documentation; PCBs are not regulated because they are not under the Insecticide, Fungicide and Rodenticide Act.

72-2293. Medved', L. I. (Inst. of Occup. Hyg. and Dis., Kiev, USSR). **Nauchno-tekhnicheskiy progress v sel'skokhozyaystvennom proizvodstve i problemy gigiyeny. [Scientific and technical progress in the agriculture and hygienic problems.]** *Vestn. Akad. Med. Nauk SSSR 26: 19-30; 1971.* (Russian)

Problems caused by agricultural progress and the work of various institutes with pesticides are discussed. The hygienic use and toxicology of pesticides have been studied in the USSR since 1928. Methods of toxicological and hygienic assessment of new compounds and rules for the use of chemicals have been standardized. In 1964, the All-Union Research Institute of Hygiene and Toxicology of Pesticides, Polymers, and Plastics was created. The Institute's work has been related to environmental pollution, the study of mechanisms of action of pesticides and their cumulative properties, depen-

dence of the pathogenic properties of pesticides on their chemical structure, and the study and prognosis of negative long-term effects. The mechanism of action has been determined for organomercuric, organophosphorus, and other types of compounds resulting in effective prophylaxis and therapy of pesticide poisoning. The new 5-year plan takes into account prospective synthesis and plans for developing chemical means of plant protection. Mathematical prognoses of the fate of various pesticides in the environment have also been made. The determination of minimal doses and the effect of pesticides on humans (genetic changes, allergies) are also discussed.

72-2294. Water Resour. Sci. Inf. Cent. (U.S. Dept. of Inter., Off. of Water Resour. Res., Washington, DC 20240). **Aldrin and endrin in water - a bibliography.** *WRSIC 72-203; 1972, 119 pp.* (78 references)

This bibliography consists of 78 abstracts with full citations and descriptor/identifier listings, compiled from the data base of *Selected Water Resources Abstracts*. A significant descriptor index and a comprehensive index with permuted listing of descriptors and identifiers for each paper are also included. Most of the papers abstracted were published between 1966 and 1971, in the form of journal articles, project reports, and bulletins from various government agencies, universities, and conferences.

72-2295. Abbott, D. C.; Collins, G. B.; Goulding, R. (Lab. of the Govt. Chem., Dept. of Trade and Ind. London SE1, England). **Organochlorine pesticide residues in human fat in the United Kingdom 1969-71.** *Brit. Med. J. 2(5813): 553-556; 1972.* (25 references)

Samples of perirenal fat were collected at autopsy from human subjects over five years of age and examined for organochlorine pesticide content. Samples were provided by pathologists in various parts of England, Wales, Northern Ireland, and Scotland. The arithmetic mean of the total BHC content in the tissues was 0.29 ppm, with β-BHC comprising all but 0.02 ppm; heptachlor epoxide, 0.03 ppm; dieldrin, 0.16 ppm; *p,p'*-DDE 1.8 ppm; *p,p'*-DDT 0.52 ppm; and hexachlorobenzene, 0.05 ppm. These values were reduced by 20-30% compared to the values found in similar studies in 1963-4 and 1965-7. This decrease is in keeping with the general decline observed for organochlorine pesticides in foods of the United Kingdom. The proportion of *p,p'*-DDT in the total DDT declined from 35% in the first study, to 26% in the second, to 21% in the current study. The mean DDT level for males from southern England was significantly higher than for males from northern England, Wales, Northern Ireland, and Scotland, and than for females from all areas. For the BHC isomers and dieldrin, the mean amounts found in the female subjects of 60 years old and under were significantly less than for males and older females. Total BHC in fat from infants and children under the age of five averaged 0.10 ppm, dieldrin < 0.01 ppm, and total DDT 0.45 ppm, again showing a decrease in comparison to earlier studies.

72-2296. Jonczyk, H.; Szczepanski, A.; Bojanowska, A.; Dmoch, J. (Dept. of San. Toxicol., State Inst. of Hyg., Warsaw, Poland). **Persistent pesticides in Mikolajskie Lake.** *Bull. Acad. Pol. Sci. Ser. Sci. Biol. 20(5): 297-303; 1972.* (7 references)

Water, seston, and two species of fish (bream and pike) typical of Mikolajskie Lake were analyzed for DDT, its derivatives, and polychloric insecticides attributable to agricultural treatment in the vicinity. Total DDT was found in all samples analyzed. The greatest amounts (close to the solubility limit 1.0 μg/l) were found in the lake water immediately after mass air treatments in the Mragowo district. In seston, total DDT was about 0.3 mg/l. Only one of the examined samples, collected months after the air spraying, contained γ-HCH (lindane). In the fleshy tissues of female bream, total *p,p'*-DDT ranged from 0.15-3.95 mg/kg; lindane, from 0-0.66 mg/kg. In males the total DDT content was from 0.11-4.90 mg/kg. In bream spawn, this content ranged from traces to 2.69 mg/kg; and lindane from 0-0.66 mg/kg. Comparative results for female pike were: total DDT, 0.10-1.13 mg/kg; lindane, 0-0.62 mg/kg. In male pike, the total DDT was 0-1.33 mg/kg. In spawn, DDT was found from minute quantities to 1.99 mg/kg, and lindane up to 1.05 mg/kg. In milt, the DDT content ranged from minute quantities to 0.76 mg/kg, and lindane from trace quantities to 0.46 mg/kg. The milt values in bream were lower, but all other tissues were higher than pike. The pollution coefficient in the fish (concentration in the organism/concentration in water) was calculated to be 1411 in bream and 824 in pike.

72-2297. Ritcey, W. R.; Savary, G.; McCully, K. A. (Res. Labs., Food and Drug Dir., Dept. of Nat. Health and Welfare, Ottawa, Ont., Canada). **Organochlorine insecticide residues in human milk, evaporated milk and some milk substitutes in Canada.** *Can. J. Pub. Health 63(2): 125-132; 1972.* (40 references)

Specimens of human milk from collection centers throughout Canada were examined for organochlorine insecticide content. On a fat basis, the samples contained < 0.01-1.94 ppm lindane, < 0.01-1.19 ppm heptachlor epoxide, < 0.10-1.57 ppm HEOD (dieldrin), 0.39-32.20 ppm *p,p'*-DDE, < 0.01-1.95 ppm *p,p'*-TDE, < 0.01-1.30 ppm *o,p'*-DDT, and 0.26-10.75 ppm *p,p'*-DDT. Milks from Quebec, Ontario, and the Atlantic provinces generally displayed lower pesticide contents than those from the provinces farther west, while the samples from the Northwest Territories had the lowest pesticide contents except in the case of HEOD and *p,p'*-DDE. Pesticide residues in reconstituted evaporated milk and in prepared baby formulas were generally appreciably lower than those in human milk, rarely averaging more than 0.01 ppm (fat basis) except in the case of the DDT components. The insecticide contents found for human milk are fairly low in comparison to those from other countries, but higher than might be anticipated based on the pesticide content of the Canadian diet. Therefore, the possible significance of home insecticide use as a source of pesticides in the human body is noted.

72-2298. Summerour, C. W. (Mississippi State Univ., State College, MS). **A quantitative study of reproductive mortality in Cattle Egrets, *Bubulcus ibis*, and Little Blue Herons, *Florida caerulea*, near Cliftonville, Noxubee County, Mississippi.** *Diss. Abstr. Int. 32(4): 2449B; 1972.*

A quantitative study of mortality in Cattle Egrets, *Bubulcus ibis*, and Little Blue Herons, *Florida caerulea*, was conducted in a heronry near Cliftonville, Noxubee County, Mississippi. Overall mortality in Little Blue Herons was 26.58% and 59.00% in Cattle Egrets. This highly significant difference was the result of mink predation which alone accounted for 23.60% of the Cattle Egret mortality as opposed to only .49% in Little Blue Herons. Seven Cattle Egret eggs and six Little Blue Heron eggs were analyzed for pesticides and all were found to contain various amounts of DDT, DDE, DDD (TDE), BHC, heptachlor epoxide, dieldrin, and Mirex. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 71-27,039).

72-2299. Leng, M. L. (Ag-Org. Dept., Dow Chemical U.S.A., Midland, MI 48640). **Residues in milk and meat and safety to livestock from the use of phenoxy herbicides in pasture and rangeland.** *Down Earth 28(1): 12-20; 1972.* (22 references)

Feeding studies were conducted with 2,4-D, MCPA, silvex, and 2,4,5-T at 10-2000 ppm in the total diet of dairy cows, beef cattle, or sheep for intervals of 2-4 weeks at each level tested. No evidence was obtained that residues of phenoxy herbicides are found in bound or conjugated form in animal tissues, or that they became concentrated in fatty tissues. No residues (< 0.05 ppm) occurred in milk or cream of cows ingesting 10-300 ppm 2,4-D, MCPA, or silvex or 10-30 ppm 2,4,5-T. Residues of phenoxy herbicides are not likely to exceed 300 ppm in or on forage immediately after treatment with these compounds at recommended rates for weeds or brush control in pastures and rangeland. Such residues decline rapidly with a half-life of 1-2 weeks depending on geographic location. It is advisable, however, that livestock not be removed from freshly treated areas for slaughter purposes. Grazing by dairy animals should be deferred for at least two weeks after treatment of pastures with 2,4,5-T, but no such limitation applies to the three other herbicides named.

72-2300. Takeda, M.; Otsuki, K.; Sekita, H.; Tanabe, H.; Takahashi, N.; Tsuchiya, T. (National Inst. Hyg. Sci., Tokyo, Japan). **[Studies on the analysis of pesticide residues in foods. V. Effects of paring and washing on the removal of pesticide residues from fruits and vegetables.]** *Eisei Shikenjo Hokoku (Bull. Nat. Inst. Hyg. Sci.) 89: 43-46; 1971.* (5 references) (Japanese)

The results of washing and paring Chinese cabbages, cabbages, spinach, apples, persimmons, Japanese pears, potatoes, sweet potatoes, and radishes to remove pesticide residues were examined. The fruit and root vegetables were pared and the skin separated from the edible portions. Leaf vegetables were separated into two groups, one of which was washed in a neutral detergent 0.5% solution for five minutes. The vegetables were moved occasionally, and after five minutes, rinsed in clean, running water. Each test material was thoroughly homogenized in a mixer, and 150g was extracted with *n*-hexane, and gas chromatography performed. After paring, all the test materials showed traces of γ-BHC, *p,p'*-DDT, and endrin. Traceable amounts of Kelthane (dicofol), aldrin, and dieldrin were found in apple and Japanese pear; in persimmon; and in potatoes, sweet potatoes, and radishes respectively. There was a significant difference in the organochlorine contents in the skin and the edible part. In apples, γ-BHC, endrin, Kelthane, and DDT distributions in the skin were 83%, 87%, 98%, and 98% respectively. Washing of leaf vegetables had almost no effect on the organochlorine contents. In Chinese cabbages, washing only decreased the DDT content from 0.011 to 0.006 ppm.

72-2301. Shcherbakov, Yu. A.; Poluboyarinova, I. V. (Saratov Dept. of the State Sci. Res. Inst. of Lake and River Fish Farming, Saratov, USSR). **Ustoychivost' butilovogo efira 2,4-D v vode i vozmozhnost' nakopleniya yego v vodnykh organizmakh. [Stability of the butyl ester of 2,4-D in water and its possible accumulation in aquatic organisms.]** *Eksp. Vod. Toksikol. Mater. Vses. Simp., 1st: 32-35; 1970.* (Russian)

The stability and accumulation of 2,4-DB in fish was studied. Concentrations of 0.015-0.2 mg/l determined in fish pond water caused massive fish death. It was also detected in the muscular tissues of fish, in soil, plants, and aquatic organisms. The 2,4-DB hydrolyzed within 9-10 days to form 2,4-D. The accumulation in carp living in water with 0.5 mg of 2,4-DB per liter was determined (32.4 mg/kg on the third, and 197.8 mg/kg on the seventh day of exposure). When the fish were living in water containing 0.05 mg of 2,4-DB per liter, traces of 2,4-DB were found on the third day, and 34.8 mg/kg of 2,4-DB and 4 mg/kg of 2,4-D on the seventh day. Traces of 2,4-DB and of 2,4-D were detected in fish living in water with 0.025-0.006 mg of 2,4-DB per liter after two months. Daphnia were found to be less sensitive to this herbicide than fish. A maximum allowable concentration of 0.006 mg/l in fisheries is recommended.

72-2302. Kavadia, V. S.; Gupta, H. C. L.; Jain, P. C. (Insectic. Dept., Rothamsted Exp. Sta., Harpenden, Herts, U. K.). **Persistence of *gamma* BHC (lindane) and malathion residues on fruits of bhindi (*Abelmoschus esculantus* L.) under Indian conditions.** *Exp. Agr. 8(2): 131-134; 1972.* (10 references)

The persistence of residues of γ-BHC and malathion on bhindi (okra) fruits under two seasonal conditions is described. The experiments were conducted in June-September, 1969, and March-May, 1970. The crops were sprayed at the beginning of each season with 0.1% γ-BHC or 0.05% malathion. Films representing extracts of the fruit samples were prepared in tightly covered petri dishes; these extracts were processed at different intervals during the seasons. One-day-old *Drosophila melanogaster* Meig. were used as the bioassay organism and exposed to the insecticidal films. Deposits of γ-BHC on the first and second crops were fairly heavy initially (25-27 ppm), but were dissipated quickly with half-lives of 3.8 days for both seasons. No residues were detected after 15 days (first season) and after 18 days (second season). Initial deposits of malathion were 21.6 and 17.5, with half-lives of approximately two days. No residues were detected after nine days. It is not known how long the effectiveness of these insecticides would last during the season.

72-2303. Kosmatyy, L. S.; Kavetskiy, V. H. (Ukrainian Res. Inst. Plant Prot., Kiev, USSR). **Opredeleniye perioda poluraspada DDVF i rasteniyakh. [Determina-**

tion of the half-life of DDVP (dichlorvos) in plants.] *Fiziol. Biokhim. Kul't. Rast. 3(5): 551-553; 1971.* (6 references) (Russian)

Degradation of dichlorvos residues (after application of 0.2 and 0.3% solutions containing 50% active matter) on cherry and apple trees followed kinetics in samples taken one hr after treatment. The half-life of dichlorvos, computed utilizing the degradation reaction's rate constant equation, was found to be 7.7 hr, in full agreement with the available literature. The half-life value of the pesticide facilitates the computation of the residual amounts at any time following application.

72-2304. Mori, K.; Tankawa, Y.; Hori, Y. (Hokkaido Inst. of Pub. Health, Hokkaido, Japan). **[Research on agricultural chemical residues in food.]** *Hokkaidoritsu Eisei Kenkyusho-Ho (Rep. Hokkaido Inst. Pub. Health) 21: 169-175; 1971.* (2 references) (Japanese)

The authors have studied organochlorine residues in vegetables, fruit, milk and dairy products, and fish since 1968. One kg samples of small vegetables and fruit or large produce were taken, chopped finely in a blender, and 100 g taken as test material. Benzene shake extracts, acetonitrile extracts, and lipid extracts were taken from food samples. To prevent poisoning the catalyst of the electron-capture detector, extracts were cleaned up in an all glass distillation apparatus and the initial distillates and the high boiling point distillates discarded. Vegetables contained various amounts of BHC ranging from 0.0046 ppm in potatoes to 0.0792 ppm in spinach; various amounts of DDT and DDE ranging from 0.0030 ppm in cucumbers to 0.0606 in spinach; traces of dieldrin in tomatoes and eggplants to 0.0065 ppm in potatoes; and a trace of endrin in potatoes and 0.0454 ppm in spinach. BHC was found at 0.0204 ppm in raw milk and at 0.0408 ppm in powdered milk. The DDT content in powdered milk (0.0578) was also higher than in raw milk (0.0268) or market milk (0.0341). DDT residues in salt water fish were extremely high; 0.172 ppm were detected in internal organs and 0.087 in other parts.

72-2305. Nishimoto, T.; Uyeta, M.; Taue, S.; Chikazawa, K.; Nishiuchi, I.; Kondo, K. (Kochi Prefect. Pub. Health Lab., Kochi-shi, Japan). **[Organochlorine pesticide residues and PCB in human fat.]** *Igaku No Ayumi (Progr. Med.) 82(8): 515-516; 1972.* (5 references)

To determine whether the levels of PCB and organochlorine residues were decreased by the banning of BHC and DDT, tests were run using the Porter et al. method on 50 human omenta. (See Abstract 71-0409). α-, β-, γ-BHC, *o,p'*-DDT, *p,p'*-DDT, *p,p'*-DDE, dieldrin and PCB were found in all specimens, regardless of sex, age, or occupation. The amounts of BHC, DDT, and dieldrin had decreased 35, 20, and 50% respectively in the last two years. Although the levels of γ-BHC, DDT, and dieldrin were similar to those of other countries, the β-BHC was 10-20 times larger; the portion of β-BHC to total BHC increased to 99%.

72-2306. Hidaka, K.; Ohe, T.; Fujiwara, K. (Kyoto Munic. Pub. Health Lab., Kyoto-shi, Japan). **[PCB and organochlorine pesticides in mother's milk.]** *Igaku No Ayumi (Progr. Med.) 82(8): 519-520; 1972.* (7 references) (Japanese)

Forty-three 40-50 ml milk specimens were taken from women of Kyoto three months after delivery. Fat was extracted by the AOAC method. Organochlorine residues were cleaned up and the PCBs hydrolyzed with alkali. Qualitative and quantitative analysis were carried out by gas chromatography with an electron capture detector. PCB, α-, β-, and γ-BHC, *p,p'*-DDT and -DDE, and dieldrin were detected in the specimens. The mean values (in ppm) were 0.05 PCB, 0.11 β-BHC, 0.12 total BHC, 0.076 *p,p'*-DDE, 0.095 total DDT, 0.005 dieldrin. The mean fat content was 2.6% and ranged from 0.83-5.5%. Since dietary records were inadequate, it was impossible to correlate the residue content of the milk with an intake of fish and meat.

72-2307. Namdeo, K. N. (Dept. of Agron., Coll. of Agr., Rewa, India). **Biodegradation of paraquat dichloride.** *Indian J. Exp. Biol. 10(2): 133-135; 1972.* (19 references)

Nine actinomycetal isolates were found to degrade paraquat in the dark up to 80% within two wk. *Streptomyces* and *Nocardia* were equally effective in degrading the herbicide, but required another source of C and N. An unidentified degradation product, possibly *N*-methyl carboxypyridylium ion had a TLC *Rf* of 0.65 in a quaternary solvent system of acidic nature. Degradation of paraquat was maximum (93.4%) using a 10^{-2} soil dilution, and minimum (13.4%) using a 10^{-8} soil dilution, suggesting the significance of an associative action in a mixed microbial culture.

72-2308. Riva, M.; Carisano, A.; Daghetta, A.; Romani, A. (Univ. Milano, Fac. Agr., Cattedra Anal. Chim. Prodotti Aliment., Milan, Italy). **Decadimento dei residui di fitofarmaci sulle frutta sottoposte a trattamento antiparassitario controllato. [Decomposition of pesticide residues on fruits subjected to controlled antiparasitic treatment.]** *Ind. Conserve. 46(2): 85-91; 1971.* (13 references) (Italian)

Following the last treatments, residues of the insecticides Aredion (tedion), aldrin, malathion, parathion, methyl parathion, and Sevin (carbaryl), and of the fungicide captan were determined on pears, peaches, strawberries, and kaki, and decomposition curves drawn. Acetonitrile extracts (chloroform extract for Sevin) were purified and the resulting hexane extracts subjected to gas chromatography. A two column chromatograph with the PFTD-KC1 detector was used for the determination

of organic nitrogen, and the ECD detector for chlorinated hydrocarbons. Parathion decomposed to 0.27 ppm between days 7-14, less than half the maximal allowable concentration (MAC); methyl parathion was reduced from 1.4 to 0.21 ppm on peaches and from 0.3 to 0.03 ppm on pears by the third day. Malathion residue was reduced from 2.95 to 0.12 ppm by the 21st day; aldrin residues diminished from 0.25 to 0.03 ppm, thus showing considerable persistence. Aredion dropped from 0.56 to 0.30 ppm by the 21st day. Although the residue is substantial, it does not seem toxic and the MAC will probably be high. Captan on strawberries dropped to < 1.0 ppm by the second day, with 15 ppm the MAC. Sevin on kaki dropped from 7.4 to 3.25 ppm after seven days, MAC 3.0 ppm.

72-2309. Hall, J. K.; Pawlus, M.; Higgins, E. R. (Pennsylvania Agr. Exp. Sta., Pennsylvania State Univ., University Park, PA 16802). **Losses of atrazine in runoff water and soil sediment.** *J. Environ. Qual. 1(2): 172-176; 1972.* (19 references)

Atrazine losses in runoff water and soil sediment were determined in 1967 and 1968 after seven rates (0, 0.6, 1.1, 2.2, 4.5, 6.7, and 9.0 kg/ha) of atrazine were applied pre-emergent to corn (*Zea mays* L.) seeded on field plots of Hagerstown silty clay loam (14% slope). Average losses for all rates in 1967 in runoff water and soil sediment equaled 2.4% and 0.16% of the total applied, respectively. In 1967, at the recommended rate (2.2 kg/ha) for pre-emergence applications to Pennsylvania soils, composite losses were 2.5% of the applied or approximately 0.05 kg/ha. In 1968, one year after atrazine application, the average loss over all rates for the combined substrates was 0.01%. Analyses of soil core samples taken from all plots in 1967 revealed that one month after atrazine application an average of 67.9% remained in the soil, and three months later recoveries had decreased to 21.4% of that applied. The following year atrazine remaining in the soil had decreased to 15.9% in April and to 5.4% in September. At the recommended rate of application, recoveries decreased from 39% of that applied to 9% for the same time period in 1967. In 1969, typical atrazine toxicity symptoms were found in oats growing on plots which had received 6.7 and 9.0 kg/ha of atrazine in 1967. Damage was confined to the uppermost parts of the slope on these treatments. (Author abstract by permission)

72-2310. Willis, G. H.; Parr, J. F.; Smith, S.; Carroll, B. R. (Soil and Water Conserv. Div., Agr. Res. Serv., U.S. Dept. of Agr., Baton Rouge, LA 70803). **Volatilization of dieldrin from fallow soil as affected by different soil water regimes.** *J. Environ. Qual. 1(2): 193-196; 1972.*

Dieldrin was surface applied at a rate of 782 g/plot to three 15.2- by 22.9-m plots [10 ppm based on 2×10^6 lb soil/acre, 15.2 cm (6 inches)]. Immediately after application, one of three soil water regimes (flooded, moist, nonflooded) was imposed on each plot. An air sampling system was used to measure the atmospheric concentration gradient of dieldrin between 10 and 30 cm above each plot. Calculations based on the aerodynamic method indicated that approximately 18% of the applied dieldrin volatilized from the moist plot in five months, whereas only 2 and 7% volatilized from the flooded and nonflooded plots, respectively. Multiple regression analysis indicated that of the climatic variables measured, temperature had the greatest effect on dieldrin volatilization. There was no apparent dieldrin degradation in any of the plots. (Author abstract by permission)

72-2311. Bindra, O. S.; Sidhu, T. S. (Punjab Agr. Univ., Ludhiana, India). **Dissipation of malathion residues on maize grain in relation to dosage, storage conditions and baking.** *J. Food. Sci. Technol. (Mysore) 9(1): 29-32; 1972.* (10 references)

Mean residues in maize grains treated at 20, 30, and 40 ppm with malathion, were 4.66, 11.94, and 22.54 ppm, respectively, after two mo. A waiting period of 2, 6, or 10 mo for 20, 30, or 40 ppm-treated grains was found to be necessary to obtain residues under the eight ppm recommended by the Codex Alimentarium Commission. Storage of the grain outside in metal bins or Hapur *thekkas* resulted in significantly lower residues than storage in mud bins or gunny bags indoors, probably because of the higher temperature outside. A 73% reduction of malathion content was obtained when grain was processed into *chapaties.*

72-2312. Anderson, J. R.; Drew, E. A. (Imperial Chem. Ind., Plant Prot. Ltd., Jealott's Hill Res. Sta., Bracknell, Berkshire, RG126EY, England). **Growth characteristics of a species of *Lipomyces* and its degradation of paraquat.** *J. Gen. Microbiol. 70: 43-58; 1972.* (12 references)

Paraquat was degraded by the soil *Lipomyces* sp. over a wide range of pH's and temperatures. Degradation was reduced only at extreme pH values. After seven days complete degradation had occurred at all temperatures studied except 39°. A lag in the growth curves of the yeast in malt broth occurred at concentrations of $5.4 \times 10^{-3} M$ or higher. N-depleted medium did not support growth, but after 12 to 24 hr the organism was capable of utilizing paraquat as a nitrogen source. Paraquat degradation occurred 24 hr after exposure to paraquat and a carbon source. The presence of other nitrogen sources did not prevent or delay the degradation. Sucrose, glucose, maltose, glycerol, starch, apple pectin, and soil extract were utilized as sole energy and carbon sources in N-free broth with $1.0 \times 10^{-4} M$ paraquat or $0.71 \times 10^{-4} M$ $(NH_4)_2SO_4$ or both. In each case paraquat was degraded. Cellulose or carboxymethyl cellulose were not utilized and the yeast did not multiply or degrade the herbicide under anaerobic conditions. Additives in Gramoxone W, a commercial paraquat prepara-

tion, interfered with growth and the degradation of paraquat at concentrations equivalent to 10^{-3} and 10^{-2} *M* paraquat ion. Results of the study suggest that the paraquat-catabolizing enzymes are induced.

72-2313. Suzuki, M.; Yamato, Y.; Akiyama, T. (Kitakyushu Munic. Inst. for Hyg., Kitakyushu-shi, Japan). **[Residual BHC concentration in surface water of Kitakyushu area.]** *Kogyo Yosui (Ind. Water) 166: 22-27; 1972.* (17 references) (Japanese)

The results of investigating the seasonal variation of residual organochlorine pesticides are reported. BHC and the ratio of every isomer to total BHC residue in water specimens are tabulated. The samples were taken at specified points on the major two rivers in Kitakyushu district and from laboratory tap water supplied from purified river water. The determination of BHC followed the method of USDI, FWPCA Publication WP-22 (1966): 10 l of the specimen were extracted 5 times with *n*-hexane, the combined extract, after dehydration, condensed to less than 4 ml and identified or determined by GLC-ECD and TLC. Except for water in the public reservoir, all the specimens showed a marked peak of BHC (total-, β- and γ-BHC) from July to August in 1970, the season corresponding to the application of BHC in paddy fields. The peak appeared in the same season in 1971 in spite of administrative guidance not to use BHC. Since the tap water in the laboratory showed the same tendency, it was concluded that the existing method of purification of public water is insufficient to remove BHC.

72-2314. Watanobe, S. (Watanobe Med. Hosp.,Aomori Prefect., Japan). **[Detection of organophosphorus insecticides from sera of patients stricken with acute poisoning with organophosphorus insecticides and its significance.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 21(1): 9-17; 1972.* (16 references) (Japanese)

A method was developed to detect organophosphorus insecticides (OP) such as fenitrothion, parathion, malathion, and salithion in the serum of 15 people who had occupationally applied OP and suffered symptoms of OP intoxication. Two ml of serum were extracted with 8 ml of acetonitrile, filtered, and washed successively with 100 ml of distilled water, 15 ml of saturated NaCl solution, and 20 ml of *n*-hexane. The hexane extract, after drying with anhydrous sodium sulfate, was evaporated to dryness. The residue was dissolved in 0.5 ml of *n*-hexane for gas chromatography. Control serum was obtained from individuals not engaged in OP application. The recovery percentage was 91.1, 83.0, 86, and 90 respectively, for fenitrothion, parathion, malathion, and salithion. The minimum detectable concentration of OP in serum was 1.4, 1.2, and 4.5×10^{-3} ppm for fenitrothion, parathion, and malathion. The findings of the tests ranged in ppm from 0.002-0.001 for parathion; 5.157-0.001 for fenitrothion; 0.57-0.028 for malathion; and 0.003-0.001 for salithion. Since parathion is not used commonly, the figure may be due to its accumulation in the body. The present findings may be useful in determining cases of suspected OP intoxication.

72-2315. Leoni, V.; Boniforti, L.; Simeone, A. M.; Caratozzolo, C.; Puccetti, G.; Biagini, F. (Istituta d'Igiene "G. Sanarelli," Univ. di Roma, Rome, Italy). **Sulla contaminazione da polichlorodifenili di campioni di alimenti e di acque superficiali in Italia. Indagini preliminari effettuate per gaschromatografia-spettrometria di massa. [Polychlorinated biphenyl contamination of food and surface water samples in Italy. Preliminary investigations performed by means of combined gas chromatography and mass spectrometry.]** *Nuovi Ann. Ig. Microbiol. 22(3): 185-215; 1971.* (44 references) (Italian)

Food and milk samples were suspected of containing polychlorinated biphenyls (PCBs) if peaks other than *p,p'*-DDT, *p,p'*-DDE, or aldrin appeared in the gas-liquid chromatography trace of *n*-hexane eluates from silica gel microcolumn cleanup of the food extracts. Water samples were cleaned up by celite-silica gel column chromatography, followed by tentative identification with ECD gas chromatography. Presence of PCBs was confirmed by mass spectrometry. PCBs were not found in water taken from the Tiber at six locations, exotic fruit, or dry vegetables, but did appear in isolated samples of cow's milk, olive oil, and pork. Of 46 milk samples taken in Milan only one revealed PCB, at 0.05 ppm; of 10 olive oil samples from Rome, only one had PCBs, at 1.25 ppm; 2 pork samples also from Rome had 1 positive reading of 0.10 ppm. Preliminary investigations are in progress in possibly contaminated fish, mollusks, and crustaceans.

72-2316. Wright, H. M.; Reynolds, R. T. (Dept. of Fish. and Wildl., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **The distribution and concentration of pesticides in central and western Oregon as measured by their impact on accipiter hawks.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, p. 91-94.*

Preliminary results indicate from 15 to 2040 μg DDE in accipiter hawks' eggs from central and western Oregon. The highest accumulation may result from transport by the prey species (sharp-shinned hawk) from other geographical areas. The percentage of young fledged appears to be smallest with this species. Additional work is being done on shell size and egg volume.

72-2317. Lindstrom, F. T. (Dept. of Agr. Chem. and Math., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Environmental chemodynamics – mathematical models of systems of chemical movement**

in the environment. *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, p. 133-137.*

Mathematical models were developed to simulate the mass transport of previously distributed organic chemicals in a water-saturated sorbing porous medium, and to describe the loss of dichlorvos from the Shell No-Pest Strip. Analytical representations of major pathways and metabolic transport systems in mammalian tissues for ethylmercuric chloride, phenylmercuric chloride, and inorganic mercury via mercuric acetate are being devised. The basis of these is the tissue compartment philosophy used in drug metabolism work. A cooperative effort is also underway to describe the transport and metabolism of dieldrin introduced in the diet of mammals via the compartment scheme and mass balance.

72-2318. Volk, V. V. (Dept. of Soil Sci., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Physico-chemical relationships of soil-pesticide interactions.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, p. 186-199.*

Potentiometric titration curves indicated a single inflection point with a mixture of H^+-montmorillonite and picloram, and two distinct inflection points with mixtures of picloram and Cu^{2+}-montmorillonite or Al^{3+}-montmorillonite. Cation saturation and time of exposure did not affect greatly adsorption of bromacil on montmorillonite. The dissociation constant for picloram was 3.98×10^{-4} from a titration curve of a 0.0015 *M* solution. Minimal protonation was found upon IR examination of HCl-treated picloram. Both molecular and anionic picloram were adsorbed by various soils from the western U.S. Soil types in order of adsorption capacity were: Panoche < Ephrata < Molokai < Palouse. Nonaqueous titration of bromacil indicated that it is weakly acidic. Using soil thin-layer radiochromatography, picloram was found to be more mobile than 2,4-D in a given soil.

72-2319. Buhler, D. R.; Caleys, R. R. (Dept. of Agr. Chem., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Chlorinated hydrocarbon pesticide and mercury content of freshwater fishes.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, p. 215.*

Analyses are being carried out for organochlorine, polychlorinated biphenyl (PCBs), lipid, cadmium, and mercury content of fish collected in the National Pesticide Monitoring Program. Most of the samples examined to date contained complex mixtures of pesticides and PCBs. The maximum values of 9.3 ppm *p,p'*-DDE and 140 ppm PCBs were found in fish from two Eastern rivers. Cadmium has not been detected, and mercury content ranged from 0.04 to 1.73 ppm. In a related study on freshwater fish from the Pacific Northwest, substantial levels of mercury were found in steelhead trout and chinook salmon that spent some time in freshwater during their spawning migration. Since these fish do not eat after entering fresh water, the methyl mercury must have been absorbed from the water.

72-2320. Claeys, R. R.; Cutshall, N.; Renfro, W. (Dept. of Agr. Chem., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **International decade of ocean exploration baseline study of diluted pollutants in the Pacific Ocean.** *Oreg. State Univ. Environ Health Sci. Cent. Annu. Progr. Rep., 1972, p. 217.*

Organochlorine analyses are being completed on 60 samples of sediment, shrimp, and flat fish collected at several locations in the Pacific Ocean off the coast of Oregon and Washington. Most of the samples contain polychlorinated biphenyls (PCB) and DDT derived compounds. The concentration of *p,p'*-DDE ranges from 13 ppm in sand shrimp to 686 ppm in mackerel.

72-2321. Goulding, R. L. (Dept. of Entomol., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Waste pesticide management.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, p. 227-229.*

Nearly complete biodegradation of industrial wastes derived from production of 2,4-D and other herbicides has been achieved in the Alkali Lake area of Oregon, in small plot applications after two years. Uncontrolled movement was a minimal hazard in this basin, and loss through volatilization or windborne particles was low. Losses have been reduced by subsurface soil injection, and degradation rates appear to be nearly as rapid as those found with surface application. Experiments in progress also indicate that the waste material could be used to eliminate undesirable range plants. In another phase of the project, site management criteria for classification and storage of spent containers, and monitoring of air and ground water, have been developed and are being used. Presently being tested is a decontamination process line.

72-2322. Montgomery, M. (Dept. of Agr. Chem., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Residues of selected pesticides – their nature, distribution, and persistence in plants, animals and the environment.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, p. 233.*

In an investigation of the ability of crop plants and brushy plants to metabolize 2,4,5-T, all of the ^{14}C applied was recovered as 2,4,5-T or a conjugate of 2,4,5-T. Gas chromatographic analysis revealed only one chlorine-containing compound, 2,4,5-T. A second study, on the soil degradation of known DDT metabolites – DDE, DDA, and DBP, indicated that the rate-limiting step in the loss of DDT from soil is the degradation of DDE. After six months, 90% of the DDE remained,

while more than 50% of the DDA and DBP were degraded. DBP was detected as a metabolite of DDA.

72-2323. Wagner, S. L.; Weswig, P. (Dept. of Agr. Chem., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Accumulation of arsenic in blood and urine of occupationally exposed forestry workers applying silvicides in the Siuslaw Forest area, 1971.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, p. 235.*

During a 12-wk period, 24-hr urine samples of workers exposed to dimethylarsenic acid were found to contain arsenic. Accumulated arsenic was eliminated rapidly following withdrawal. The concentration of arsenic in whole blood was not a sensitive indicator of exposure. Since none of the workers complained of illness during the study, threshold excretion values were not established. The compound appears to be safe for use by forestry workers when handled properly.

72-2324. Luquet, F. M.; Goursaud, J.; Gaudier, B. (Services Vet., Lab. Recherche Ind. Lait., 59 - Douai, France). **Etude de la pollution des laits humains par les residus de pesticides. [Study of the pollution of human milk by residual pesticides.]** *Pathol.-Biol. 20(3-4): 137-143; 1972.* (5 references) (French)

A total of 59 human milk samples were analyzed qualitatively and quantitatively by gas chromatography to determine pesticide residues. Pesticide residues such as HCH (BHC), hexachlorobenzene (HCB), heptachlor, dieldrin, or DDT and its metabolites were detected in all samples, with total pesticide residue levels ranging from 1.620 to 5.70 mg/kg. The total of α, β, and γ-BHC isomers in 45 samples ranged from zero to 0.190 ppm, and the individual isomers were in the respective ranges of 0-0.011 ppm, 0.012-0.199 ppm and 0.001-0.013 ppm. Heptachlor contents of 0.002-0.012 ppm were determined in 13 samples. Six samples contained dieldrin in concentrations ranging from 0.007 to 0.032 ppm. Traces of DDT, and particularly of its metabolites (DDE and DDD), were detected. The presence in the human milk samples of pesticide metabolites indicates chronic effect.

72-2325. Egan, H. (Lab. of the Govt. Chemist, Cornwall House, Stamford Street, London SE I, England). **Pesticides and toxic chemicals.** *Proc. Nutr. Soc. 31(1): 23-32; 1972.* (41 references)

Pesticide residues in food generally may be attributed to farmers' using pesticide chemicals, many of which are characterized by their resistance to chemical and biological degradation. Organophosphorus pesticide residues detected in total diet are tabulated; the most common was malathion. Analyzed hens' eggs demonstrated that higher residues are found in firms using thermal vaporizers (with organochloride pesticides) than in those not using such devices. The decline of dieldrin levels in mutton kidney-fat is illustrated in a table showing residue levels for 1964-1970. The drop is attributed to industry's voluntary withdrawal in 1966 of sheep dips containing this product. Lead content in lettuce and cabbage and cadmium content in total diet samples are also tabulated. Polychlorinated biphenyls, where they appeared, occurred predominantly in marine wildlife and are not representative of human dietary residues in Britain. Arsenic seems to be less toxic to avian and mammalian species compared to mercury. In aquatic organisms, inorganic mercury residues can be transformed biologically into the toxic methylmercury compounds. Antibiotic residues and radioactive nuclides, and trace metals used for crop protection are discussed. Other contaminants mentioned include nitrosamines, polynuclear aromatic hydrocarbons, fluorides, and bacterial toxins.

72-2326. Price, N. O.; Young, R. W.; Dickinson, J. K. (Dept. of Biochem. & Nutr., Virginia Polytech. Inst. and State Univ., Blacksburg, VA 24061). **Pesticide residues and polychlorinated biphenyl levels in diets, urine and fecal matter of preadolescent girls.** *Proc. Soc. Exp. Biol. Med. 139(4): 1280-1283; 1972.* (23 references)

A summary of the screening for pesticide residues in girls 7-9 years of age, is presented. The diets were designed to represent foods consumed by the lower socioeconomic groups. The subjects were randomly assigned within weight groups to four modifications of the basal diet and were maintained on them for two periods of six days. Diet supplementation with amino acids, ammonium citrate, or calcium lactate did not affect the residue levels. Pesticide residues were found in all samples of the diets, urine, and feces. With the exception of chlorinated cyclodienes, excretion of all residues was greater in the feces, especially for polychlorinated biphenyls (PCBs). With the exception of DDT and its metabolites (with 32%), excretion of residues was 9 to 12%. PCBs were found in the eight diets analyzed; four contained traces and four contained 200, 420, 580, and 840 μg/day/subject.

72-2327. Ware, G. W.; Estesen, B. J.; Cahill, W. P. (Author address not given). **What's happened after 2 years moratorium?** *Progr. Agr. Ariz. 23(3): 8-10; 1971.*

Following the agricultural DDT moratorium in Arizona in 1969, DDT residues were monitored in green alfalfa, soil, and beef fat. The residues at the termination of the three growing seasons, 1968, 1969, and 1970 are tabulated for DDTR (includes DDT and derived compounds). The green alfalfa residues from all areas tested leveled off at 0.5 ppm. The beef fat residues dropped from 0.96 ppm to 0.49 ppm. Residues in the alfalfa soil

declined only slightly between 1969 and 1970; however, the suggested half-life for these soil residues is probably greater than 10 years. DDE was the most persistent metabolite in all samples.

72-2328. Luquet, F. M.; Goursaud, J.; Leroy, M.; Roux, M.; Marciniak, C.; Delannoy, F.; Degros, A. (Author address not given). **Les residus de pesticides organochlores dans le lait et les produits laitiers. Bilan 1969-1970-1971. [Residues of chlorinated hydrocarbon pesticides in milk and dairy products. 1969-1970-1971.]** *Rev. Lait. Fr. 296: 195-197; 1972.* (French)

A comparison of the organochlorine levels in the dairy products of various countries is given. In milk in the United Kingdom between 1967-1969, total BHC isomers averaged 0.002-0.004 ppm; dieldrin, 0.001-0.002 ppm; DDT+DDE+TDE 0.002-0.0035 ppm. In butter the levels were 0.07-0.08, 0.03 and 0.05-0.06 ppm respectively. Pesticide levels in butter differed according to country of origin. The smallest amounts of total BHC were found in samples from Australia and New Zealand (0.001 ppm), the largest amounts in those from France (0.46 ppm).

72-2329. Vrochinskiy, K. K. (All-Union Res. Inst. Hyg. and Toxicol., Kiev, USSR). **Vozmozhnyye popadaniya PKhK v rybokhozyaystvennyye vodoyemy. [Possible consequences of the occurrence of polychlorocamphene in fishery reservoirs.]** *Ryb. Khoz. 4: 32-33; 1971.* (Russian)

Reservoir waters containing 0.004 mg/l of polychlorocamphene (toxaphene) have an unpleasant taste; an unpleasant odor is produced by 0.008 mg/l. No alterations in pH, dissolved oxygen, or nitrogen compounds are produced by toxaphene concentrations ranging from 0.004 to 4.0 mg/l; however, the BOD increases at toxaphene concentrations exceeding 0.04 mg/l. Accumulation in fish organs and tissues occurs at toxaphene concentrations of 0.0002 to 0.02 mg/l; muscular tissue accumulations of 0.45 mg/kg can be found in reservoirs containing as little as 0.0002 mg/l. According to model studies on ecosystem contamination, a single toxaphene application of 50 mg/l results in detectable residues in the water and water plants as much as 82 days later; toxaphene can be found in sediment at 1.6 mg/kg 113 days after application. Therefore, toxaphene should not be utilized in the treatment of water reservoirs for fishery or domestic use.

72-2330. Vivoli, G.; Manicardi, G. (Istituto d'Igiene Dell'Univ. di Modena, Modena, Italy). **Residui de insetticidi cloro-organici di sintesi in vari tipi di formaggi Italiani ed esteri. [Organochlorine insecticide residues occurring in different varieties of Italian and foreign cheese.]** *Sci. Aliment. 17(9): 207-213; 1971.* (10 references) (Italian)

Seventy-seven Italian and some foreign cheese samples including parmesan, sheep's milk cheese, Gorgonzola, Emmenthal, robiola, Bel Paese, Certosino, and mozzarella were subjected to analysis for organochlorine pesticide residues. The parmesan samples had total organochlorine contents exceeding 1 ppm; DDT-group compounds and dieldrin ranged from 0.28 to 0.58 ppm; total BHC residues averaged 0.22 ppm. The sheep's milk cheese samples had average organochlorine pesticide levels of 2.7 ppm, with dieldrin and DDT 0.55 and 1.68 ppm, respectively. Gorgonzola had much lower total pesticide levels (1.02 ppm), and both the Swiss- and Italian-made Emmenthal had the lowest total organochlorine contamination levels, averaging 0.30 ppm. The soft cheese varieties presented a wide range in total pesticide contamination levels from 0.63 to 5.84 ppm. Total pesticide contents in 13 imported cheeses averaged 1.781 ppm.

72-2331. Kuroda, H.; Yano, T.; Kagawa, K.; Mitsumune, M. (Kagawa Prefect. Res. Lab. for Hyg. and Pub. Nuisance, Takamatsu-shi, Japan). **[On the residual organochlorine pesticides in mother's milk.]** *Shikoku Koshu Eiseigakkai Zasshi (J. Shikoku Pub. Health Soc.) 17: 79-80; 1972.* (Japanese)

Residual organochlorine pesticides were determined in mothers' milk from 20 women in the Prefectural General Hospital, 10 from farming families and 10 from non-farming families. The specimens of 60-80 ml were analyzed by GLC-EDC. BHC, DDT, and dieldrin were found in all. The fat content of the milk was greater in non-farming families than in farming ones, as was the quantity of DDT and dieldrin, the latter being about three times larger than the average of the entire country. The BHC content, basically β-isomer, was 3.7 times larger in the milk of non-farming families. Contamination by BHC was probably caused by ingestion of contaminated beef and dairy products; dieldrin was attributed to contaminated vegetables.

72-2332. Takeda, M.; Nishikawa, M.; Uyeta, M.; Matsunaga, K.; Kashimoto, T.; Narafu, T.; Minagawa, O.; Sakai, K.; Mori, K.; Otsuki, K.; Sekito, H.; Tanabe, H. (Nat. Inst. of Hyg. Sci., Setagayaku, Tokyo, Japan). **[Pesticide residues in dairy products and meat. Part I. Organochlorine pesticide residues in milk.]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Japan) 13(4): 299-309; 1972.* (13 references) (Japanese)

A study group from the Ministry of Health and Welfare for Pesticide Residues in Dairy Products and Meat ran a series of tests including one on the distribution of organochlorine pesticide residues (α-, β-, γ- and total BHC, p,p'-DDT, -DDE, -DDD and total DDT, aldrin, dieldrin, and endrin) in raw and market milks from eight Japanese prefectures between January, 1969, and March, 1971. Generally in the western regions of Japan, where organochlorine pesticides were applied in large

amounts in crop fields, the residue levels in milk were higher than those in eastern prefectures. Residues of β- and total BHC were much higher in western Japan, the highest being 0.97 ppm and 1.31 ppm in February, 1970, respectively. Little difference was observed in other pesticide residues. Aldrin, dieldrin, and endrin were found at low levels or not at all. Contamination of milk by total BHC decreased to 10-50% of the initial value by the end of the survey. To elucidate the source of contamination by the organochlorine pesticides, especially β-BHC, residues in cow feed were examined. Because BHC was abundantly detected in rice straw, it was concluded that a large portion of the BHC in milk was derived from the rice straw used for cattle feed. This conclusion was supported by the fact that raw milk from cows fed without rice straw contained very little BHC (Okayama prefecture).

72-2333. Sakai, K.; Mori, K.; Minagawa, O.; Narafu, T.; Kashimoto, T.; Matsunaga, K.; Uyeta, M.; Nishikawa, M.; Otsuki, K.; Sekita, H.; Takeda, M.; Tanabe, H. (Miyagi Prefect. Pub. Health Lab., Sendai-shi, Japan). **[Pesticide residues in dairy products and meat. Part 2. Organochlorine pesticide residues in dairy products.]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Japan) 13(4): 310-316; 1972.* (2 references) (Japanese)

Organochlorine pesticide residues were determined by gas chromatography in numerous dairy products, including 52 modified milk powders, 43 butters, 7 cheeses, and 6 skimmed milks, obtained in Japan between October, 1968, and March 1971. The residues were detected in the highest concentrations in butter: mean β-BHC, 0.23 ppm; mean total BHC, 3.1 ppm; mean total DDT, 1.3 ppm; mean dieldrin, 0.06 ppm. Next highest were the modified milk powders: mean β-BHC, 0.13 ppm; mean total BHC, 0.23 ppm; mean total DDT 0.13 ppm; mean dieldrin, 0.004 ppm. In spite of the high fat content of the cheeses (ca. 30% fat), the pesticide residues in these were relatively lower than those in other products: mean β-BHC, 0.021 ppm; mean total BHC, 0.051 ppm; mean total DDT, 0.048 ppm. Dieldrin was not detected in cheese. This is probably due to the fact that raw cheeses are generally imported from countries where pesticide contents of cattle feed are low, then processed in Japan. When the modified milk powder was mixed with water to form a 15% solution for baby feeding, the pesticide content was generally lower than that of raw milk, presumably due to partial replacement of butterfat by vegetable oil.

72-2334. Minagawa, O.; Mori, K.; Sakai, K.; Narafu, T.; Kashimoto, T.; Matsunaga, K.; Uyeta, N.; Nishikawa, M.; Takeda, M.; Tanabe, H. (Niigata Prefect. Pub. Health Lab., Niigata-shi, Japan). **[Pesticide residues in dairy products and meat. Part 3. Organochlorine pesticide residues in fishes and shellfishes.]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Japan) 13(4): 317-325; 1972.* (12 references) (Japanese)

Pesticide residues were determined in 101 specimens of fish and shellfish collected from rivers, lakes, and sea in Japan between August, 1969, and February, 1971. Total BHC levels (based on fresh weight of tissue) in these specimens were 0.009-0.79 ppm in fresh water fish and 0.004-0.21 ppm in marine fish and shellfish; total DDT levels were 0.014-0.87 ppm in fresh water fish and 0.002-0.15 ppm in marine fish and shellfish; dieldrin levels were 0.000-0.14 ppm in fresh water fish and 0.000-0.039 ppm in marine and shellfish. The pesticide levels in marine fish and shellfish from Aichi prefecture were about ten times greater than those from Niigata or Hokkaido.

72-2335. Otsuki, K.; Sekita, H.; Takeda, M.; Tanabe, H. (Nat. Inst. of Hyg. Sci., Setagaya-ku, Tokyo, Japan). **[Studies on analysis of pesticide residues. Part 6. Organochlorine pesticide residues in imported meat.]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Japan) 13(4): 338-343; 1972.* (6 references) (Japanese)

Recently, due to changes in Japanese dietary habits, large quantities of refrigerated meat have been imported to make up for the deficiency in domestic meat. Pesticide residues in meats from various countries were determined by the FDA method. Japanese beef fat contained 5.9 ppm total BHC, of which 0.72 ppm was α-BHC, 4.9 ppm β-BHC, and 0.12 ppm γ-BHC (lindane). DDT in Japanese beef totaled 0.081 ppm, and dieldrin, 0.051 ppm. Pesticide levels in chicken and pork fat from Japan were lower than those in beef fat, except that total DDT in pork fat averaged 0.21 ppm. Fat of beef imported from Australia contained 0.026 ppm total BHC and 0.14 ppm total DDT; from the U.S.A., 0.065 ppm total BHC and 0.39 ppm total DDT. Pesticide residues in chicken, imported from Bulgaria, the U.S.A., Denmark, and New Zealand were low, except that the fat of U.S. chickens contained 0.24 ppm total DDT. Pesticide residues in horsemeat, mutton, and lamb were generally below 0.1 ppm. Fat of rabbits imported from the People's Republic of China contained 1.8 ppm total BHC and 6.2 ppm total DDT. Lamb and mutton fat from Australia and New Zealand contained 0.21-0.73 ppm total DDT. Thus imported meat seems to offer no greater threat of pesticide contamination to the Japanese consumer than does domestic meat.

72-2336. Westoo, G.; Noren, K.; Andersson, M. (Vitaminavdelningen, Statens Inst. for Folkhalsan, Stockholm, Sweden). **Klorpesticid- och polyklorbifenylhalter i nagra cerealieprodukter. [Levels of organochlorine pesticides and polychlorinated biphenyls in some cereal products.]** *Var Foeda 23(10): 341-361; 1971.* (13 references) (Swedish)

Thin-layer and gas-chromatographic, mass-spectrometric, and extraction methods were used to

detect organochlorine pesticides and polychlorinated biphenyls in 300 samples of cereal products (bread, biscuits, macaroni, meal, flour, breakfast cereals, children's foods) and their packagings. Small quantities of lindane, usually below 0.1 mg/kg, were determined in most of the samples. The lindane contents exceeded 0.5 mg/kg in some bread and breakfast cereal samples, and in one sample a level of 1.5 mg/kg was determined. Decomposition products of lindane, formed during baking, such as γ-1,3,4,5,6-pentachlorocyclohexene, in a maximum concentration of 0.1 mg/kg, and traces of three different trichlorobenzene isomers, mostly 1,2,4-trichlorobenzene, were also detected in such samples. Traces of DDT and α-BHC were found in some bread samples. Polychlorinated biphenyls, originating in the packaging material, were detected in breakfast cereals, macaroni products, children's foods, and one rice and one biscuit sample. Levels above 1 mg/kg in some children's foods and breakfast cereals, and especially high contents which increased with storage time in the packagings, were determined.

72-2337. Hance, R. J. (Agr. Res. Counc., Weed Res. Org., Begbroke Hill, Yarnton, Oxford, England). **Complex formation as an adsorption mechanism for linuron and atrazine.** *Weed Res. 11(2-3): 106-110; 1971.* (8 references)

Measurements were made of the effect of exchangeable cations on the adsorption of linuron and atrazine by an ion-exchange resin, cellulose phosphate powder, bentonite and a peat soil. The cations studied were Ca^{2+}, Ni^{2+}, Cu^{2+}, Fe^{3+}, and Ce^{4+}. The results with linuron were consistent with the hypothesis that complex formation with exchangeable cations is a possible mechanism of adsorption. This was not so with atrazine due to complications arising from pH effects, and it seems unlikely that adsorption of atrazine by this process is significant. (Author abstract by permission)

72-2338. Baur, J. R.; Baker, R. D.; Bovey, R. W.; Smith, J. D. (Plant Sci. Res. Div., Agr. Res. Serv., U.S. Dept. of Agr., Dept. of Range Sci., Texas A & M Univ., College Station, TX 77843). **Concentration of picloram in the soil profile.** *Weed Sci. 20(4): 305-309; 1972.* (24 references)

Soil residue levels were studied to a depth of 2.4 m for a period of 2 years after application of 1.12 kg/ha of 4-amino-3,5,6-trichloropicolinic acid (picloram). Thirty days after application 93 ppb were recovered in the top 15 cm of soil. Residues were less than 5 ppb at depths of 46 to 122 cm. Six months after application, residues were between 5 and 10 ppb down to 183 cm and less than 5 ppb between 198 and 244 cm. Residues to depths of 244 cm were less than 5 ppb 1 year after treatment. Residue levels to similar depths were studied in two soil types for a period of 1 year after application of conventional and polymerized picloram sprays and granules (3.4 kg/ha of picloram). Conventional sprays resulted in significantly higher soil residues for the sampling period than polymerized sprays. Residues from polymer granules were likewise significantly greater than from polymer sprays. Conventional and polymer formulations were identical with respect to movement through the soil. (Author abstract by permission)

72-2339. Baur, J. R.; Bovey, R. W.; Merkel, M. G. (Plant. Sci. Res. Div., Agr. Res. Serv., U.S. Dept. of Agr., Dept. of Range Sci., Texas A & M Univ., College Station, TX 77843). **Concentration of picloram in runoff water.** *Weed Sci. 20(4): 309-313; 1972.* (14 references)

Runoff water was sampled over a 2-year period from an 8-ha site that had been treated and retreated with 4-amino-3,5,6-trichloropicolinic acid (picloram) at the rate of 1.12 kg/ha in the spring of 1969 and 1970. Runoff water was sampled adjacent to the plots and in two creek systems up to 2.0 km from the plots. Samples taken adjacent to the plots declined to less than 10 ppb by 10 to 12 weeks after application. Eight days after application, water sampled 1.2 km from the plots contained less than 1 ppb of picloram. Less than 1.0 ppb levels were occasionally detected 1.6 km from the plots 8 months after treatment. (Author abstract by permission)

72-2340. Grover, R.; Maybank, J.; Yoshida, K. (Res. Sta., Canada Dept. Agr., Regina, Sask., Canada). **Droplet and vapor drift from butyl ester and dimethylamine salt of 2,4-D.** *Weed Sci. 20(4): 320-324; 1972.* (14 references)

The relative drift of droplet and vapor of butyl ester and dimethylamine formulations of (2,4-dichlorophenoxy)acetic acid (2,4-D) was determined under conventional crop spraying procedures in the field. Labelled herbicides were mixed with spray solution or emulsion, and the ground deposit and the air-borne droplet and vapor clouds drifting from the target area were collected. The mass of the dimethylamine formulation drifting as droplets was 3 to 4% of the material sprayed. No significant amounts of this material were collected as vapor or particulate drift. For the butyl ester, in addition to the droplet drift, 25 to 30% of the material was collected as vapor drift in the half hour after spraying. Thus the drift potential from the butyl ester was about 8 to 10 times greater than that from the dimethylamine formulation under the conditions of these tests. (Author abstract by permission)

72-2341. Skipper, H. D.; Volk, V. V. (Monsanto Co., St. Louis, MO 63166). **Biological and chemical degradation of atrazine in three Oregon soils.** *Weed Sci. 20(4): 344-347; 1972.* (14 references)

Microbial degradation of 2-chloro-4-(ethylamino)-6-(isopropylamino)-*s*-triazine (atrazine) and 2-hydroxy-

4-(ethylamino)-6-(isopropylamino)-*s*-triazine (hydroxyatrazine) was investigated in three Oregon soils. Hydrolysis of atrazine was determined by the presence of ^{14}C-hydroxyatrazine in methanol extracts. Respired $^{14}CO_2$ from the ^{14}C-ethyl side chain of atrazine represented less than 10% of the added ^{14}C in the soils after 28 days. Degradation was dependent on soil type, atrazine concentration, and moisture content. The isopropyl and ring constituents of atrazine were subject to minimal attack. The hydroxyatrazine ring was attacked more readily than the atrazine ring. Hydroxyatrazine accounted for approximately 10% of the extracted ^{14}C from ^{14}C-atrazine-treated Parkdale-A, Parkdale-C, and Coker soils and 40% from the Woodburn soil. Hydrolysis was the dominant pathway of detoxification in the Woodburn soil, whereas detoxification of atrazine in Parkdale-A, Parkdale-C, and Coker soils was a combination of chemical hydrolysis and slow microbial degradation by *N*-dealkylation of the ethyl side chain constituent. (Author abstract by permission)

72-2342. Nagy, S.; Tomus, R.; Chelberg, N. (Kozegeszsegugyi es Orvosi Kutato Intezet, Cluj, Rumania). **Egyes foszforsaveszter peszticidek vizben valo perzisztenciajara vonatkozo laboratoriumi kiserletek. [Laboratory investigations into the persistence in water of some pesticides of phosphate ester nature.]** *Egeszsegtudomany 15: 65-73; 1971.* (24 references) (Hungarian)

The persistence of five organophosphorus pesticides (malathion, dimethoate, ethion, bromophos, and ronnel) was investigated by semiquantitative determination of the concentration in water emulsion after 90 days, and by determinations of the variations in the odor threshold and the global toxicity. The emulsions, pH 5-5.5, contained active substance in concentrations of 0.2-150 mg/l of water. Significant variations in the persistence were obtained only for fairly high concentrations (10 mg/l). The semiquantitative determination of the concentrations revealed malathion to be least persistent (7-21 days), and dimethoate to be most persistent. The three other emulsions lost 20-25% of their original pesticide contents. Investigations into the variations of the odor threshold showed that ethion and dimethoate were ineffective on the fifth day, while bromophos and ronnel were persistent over 10 days. Malathion was found to be most persistent with 21 days. Dimethoate lost its toxic effect in one to four days, while ethion was fully effective on the 30th day. Both the odor threshold and the global toxicity were reduced by the aeration of the emulsion. As the results were dependent on the specific test applied, it was not possible to establish a toxicity sequence of the above pesticides.

See also 72-2289 72-2428 72-2479 72-2483 72-2496

72-2343. McLennan, M. W.; Dodson, M. E.; Kelly, J. (Dept. of Agr., Adelaide, South Australia, 5000). **Arsenic poisoning in cattle.** *Aust. Vet. J. 48(6): 367; 1972.* (5 references)

The case history is presented of an acutely poisoned cow which ingested arsenic present in a water vat. Staggering was observed in the animal, and examination found rapid, weak pulse and intermittent clonic convulsions and paddling movements. Abdominal pain was not detected. A diagnosis of hypomagnesemia was made. The cow was treated with a Ca-P-Mg preparation which caused a transitory amelioration. However, the animal was dead the next morning. Since other animals from the same paddock had died, the surviving cattle were promptly removed. An autopsy was performed on one of the heifers. The findings were: a yellow friable liver; intense congestion; edema and patchy ulceration of the abomasal mucosa; and congestion of the small intestine, cecal mucosae, and the cerebral meninges. Subsequent analyses of rumen contents and vat water revealed 45 ppm arsenious oxide in the former and 200 ppm arsenic in the latter. Previously, the vat had contained sheep dipping solution which had dried and then been diluted with rain water.

72-2344. Daggett, E. (Author address not given). **That little accident in Needles wasn't much – but it could have been a catastrophe.** *Calif. Health 30(1): 8-10; 1972.*

The account of an accident in Needles, California, emphasizes the need for careful handling in the transportation of toxic materials. In this particular incident, the cargo was 26,000 pounds of aluminum phosphide crystals (a precursor of phosphine). An explosion occurred in one of the drums in a trailer parked outside a diner. The lid of one drum blew off and three other lids were loosened. A physician and a professional engineer telephoned CHEMTREC (chemical transportation emergency council), an industrial poison center, in Washington, D.C.,similar to the national poison center in Atlanta, Georgia. Advice on handling was given. In this case the cargo was to be kept cool and dry, with dry ice, if possible. All individuals who had been near the trailer were asked to contact the Los Angeles medical officer of the Highway Patrol. A specialist of the Highway Patrol pointed out that the documents (with respect to emergency measures) accompanying the shipment were evidently ignored. Although no one was hurt, the shipment of hazardous material was dangerous to the industrial employees, the police, and anyone who was present at the accident. Precautionary measures are strongly recommended.

72-2345. Doane, C. C.; Schaefer, P. W. (Dept. of Entomol., Univ. of Maine, Orono, ME 04473). **Aerial application of insecticides for control of the gypsy moth: with studies of effects on non-target insects and birds.** *Conn. Agr. Exp. Sta. New Haven Bull. 724: 5-22; 1971.* (17 references)

Dylox (trichlorfon), Gardona (tetrachlorvinphos), and Sevin (carbaryl) were tested for their effects on gypsy moths in Connecticut. All three formulations reduced gypsy moth density to low levels. Leaf feeding lepidopterans seemed equally susceptible to these insecticides. Sarcophagid and tachinid flies were not affected by Sevin, but were reduced by the other two pesticides. One control area and three treated plots were monitored for any change in bird activity. Two 1-hr counts were made on eight days in each of the four plots monitored, the two parameters recorded being sighting and hearing (of a song or call). Notes were also made on all nests discovered in the test plots, as well as in three additional spray plots. Little apparent difference was reflected in the data involving sighting; an analysis of the different species heard shows that the species complex changed between pre- and post-treatment and that bird activity was decreased after insecticide treatment. The application of the insecticides caused a depletion in the available food for the birds. *Calosoma* species were susceptible to Sevin residues.

72-2346. Bwibo, N. O. (Dept. of Paediat., Univ. of Nairobi, Nairobi, Kenya). **Accidental poisoning with diazinone – an organophosphorus insecticide.** *East Afr. Med. J. 48(10): 601-605; 1971.* (11 references)

Four cases of diazinone (diazinon) poisoning in children are discussed. Treatment of three of the patients included removal of secretions in the mouth, gastric lavage, administration of atropine (1/2 to 1 mg im or iv) at 15 min to 30 min intervals until atropinization was evident, and maintenance of atropinization when necessary. Fursemide was administered in one case to induce diuresis, and paraldehyde and penicillin were also used. All the children recovered. The fourth patient showed no signs of poisoning after ingestion of a small amount of the material and was sent home after observation. The above procedure is recommended in cases of diazinon poisoning along with administration of 2 PAM, if available. Morphine, phenothiazide derivatives, theophylline, aminophylline, ether, and barbiturates should not be given since they are respiratory depressants and also lower ChE levels.

72-2347. Braginskiy, L. P. (Inst. of Hydrobiol., Ukrainian SSR Acad. of Sci., Kiev, USSR). **Sovremennoye sostoyaniye problemy pestitsidov v vodnoy toksikologii. [Pesticide problems in water toxicology: state of the art.]** *Eksp. Vod. Toksikol. Mater. Vses. Simp., 1st: 5-7; 1970.* (Russian)

Current problems in the toxicology of aquatic pesticides are reviewed. Although toxicological studies of insecticides have been extensive, few investigations have been done on herbicides and algicides. However, about fifty herbicides such as 2,4-D derived compounds, endothall, monuron, diuron, neburon, fenuron, sima-

zine, alvazine, prometryne, simeton, dalapon, and dalazine are used, often in granulated form, for aquatic weed control. Many specific algicides are also used; their efficacy is limited by the rapid adaptation of the algae. While herbicides are less dangerous than organochlorine insecticides, they have gonadotrophic effects at small concentrations. Fish death may be caused by acute or chronic poisoning, asphyxiation, the effects of small residues on reproduction, or by radical changes in the ecological conditions. Organochlorine insecticides affect reproduction, ontogenesis, viability of offsprings, phytoplankton production, and possibly mutagenesis and teratogenesis. Effects of the latter are being studied.

72-2348. Popova, G. V. (Cent. Lab. of Nature Preserv. of the USSR Min. of Agr., Moscow, USSR). **K voprosu o vliyanii pestitsidov na ryb. [Effects of pesticides on fish.]** *Eksp. Vod. Toksikol. Mater. Vses. Simp., 1st: 13-15; 1970.* (Russian)

Effects of pesticides on fish are reviewed. Pesticides can damage fish directly, as well as indirectly by changing the vital conditions. Urea derived compounds affect the hydrochemical conditions, and herbicides destroy phytoplankton. Many pesticides, mostly organochlorine compounds, are hazardous even in very small concentrations through accumulation in the organism. Other pesticides have a retarded effect, associated with stress in some cases, while massive fish death is primarily due to acute poisoning. Pesticides usually enter fish through the gills and are carried away by the blood. Experiments with diuron, propanid, and monuron revealed that alterations in the blood picture are the most sensitive indicator for the presence of pesticides in fish.

72-2349. Jager, K. W. (Indust. Med. Dept., Shell Nederland Raffinaderij N. V. and Shell Nederland Chemie N.V., Rotterdam, The Netherlands). **Aldrin, dieldrin, endrin and Telodrin.** *Elsevier Publishing Co., Amsterdam/London/New York, 1970. 234 p.* (271 references)

Following general introductory remarks on pesticide toxicity, results are summarized of epidemiological and toxicological observations on almost 900 workers occupationally exposed to organochlorine insecticides for varying periods of time in a manufacturing plant. The principal findings of the study indicate that occupational exposure to aldrin, dieldrin, endrin, and Telodrin (isobenzan), for up to 15 years, did not have any detectable, persistent adverse effect on health, even though transient toxic phenomena were sometimes noted. Signs of endrin intoxication were generally reversed within a few days, aldrin and dieldrin within weeks, and Telodrin within six months. The levels of insecticide concentration below which no signs of intoxiciation ever occurred were 0.20 μg/ml for dieldrin, which is more than 300 times the present dieldrin level in the blood of the British and U.S. populations; 0.015 μg/ml for Telodrin; and 0.05-0.1 μg/ml for endrin. Enzyme induction occurred at half these levels in some cases. The biological half-life of dieldrin is 0.73 yr, that of Telodrin 2.77 yr, and that of endrin, about 24 hr. The absenteeism rate of workers in the insecticide plant was similar to that found for other branches of the chemical industry.

72-2350. Kaskevich, L. M. (All-Union Sci. Res. Inst. of Hyg. and Pestic., Polym. and Plast. Toxicol., Kiev, USSR). **Khronicheskiye porazheniya pecheni, vyzyvayemyye pestitsidami. [Pesticide-induced chronic liver damage.]** *Fel'dsher Akush. 36(1): 14-16; 1971.* (Russian)

Symptoms and therapy of chronic liver damage induced by organic mercury, organochlorine and organophosphorus pesticides are reviewed. Dyspepsia and pains in the right hypochondrium are general symptoms of liver damage and also indicate concomitant damage of the nervous and cardiovascular systems and the gastrointestinal tract. Organic mercury compounds such as granosan and mercuran block SH-groups and interfere with the metabolism of carbohydrates, proteins, and fat. Reduced albumin levels and albumin-globulin coefficients, increased γ- and α2-globulin levels, and fatty and proteinaceous degeneration of the liver occur. The development of cirrhosis and splenomegalia is possible. Inhalations of 5%-unithiol over 10-14 days are prescribed. Organochlorine pesticides inhibit oxidative-regenerative enzymes, and may cause hepatomegalia, reversible dystrophy, focal necrosis, and inflammations. Organophosphorus pesticides inhibit the cholinesterase activity and cause dysfunction in the carbohydrate and protein metabolism, and fatty degeneration of liver cells. The administration of lipophilic substances and vitamin B is recommended.

72-2351. Medvedovskaya, Ts. P.; Golenko, V. S. (Inst. of Occup. Health and Dis., Kiev, USSR). **Sostoyaniye organa zreniya u rabotnits krupnoblochnykh plenochnykh teplits. [The state of the organ of vision in female workers of large-block film-coated hothouses.]** *Gig. Tr. Prof. Zabol. 15(5): 32-35; 1971.* (15 references) (Russian)

Ophthalmological examinations of 33 female workers of large-block film-covered hothouses are described. The workers had been exposed to the effects of pesticides (rapor, carbophos (malathion), DDT, thiovit, ziram, zineb), carbon monoxide, and both high temperature and humidity. The pesticide concentrations in the air were two to ten times larger than the maximum allowable values hours after application. Eye pains, xerophthalmus, photophobia, lachrymation, and decreased secretion were common complaints. Eye diseases, mainly in the anterior portion, were determined in 36.3 ± 8.3% of all cases. Refraction anomalies (slight myopia or myopic astigmatism) and degenerative alterations of the conjunctiva (pinguecula and pterygium) were detected in 33%. Chronic conjuctivitis was found in

four cases. The intraocular pressure was slightly higher than that of the control group, and minor punctate opacifications and erosions of the cornea of traumatic origin, frequent hypotonia in the central retinal artery, and microscopic alterations in the crystalline lens were found. Dysfunctions of the visual analyzer appeared in the form of reduced central and peripheral color perception.

72-2352. Ashirova, S. A.; Reznik, N. D.; Rumyantseva, Ye. P.; Tomichev, A. I.; Nabatova, T. V. (Inst. of Occup. Health and Dis., Gor'kiy, USSR). **Nekotoryye voprosy gigiyeny truda i sostoyaniya zdorov'ya rabochikh proizvodstva polikhlorkamfena. [Problems of occupational health with regard to polychlorocamphene manufacturing plants.]** *Gig. Tr. Prof. Zabol. 15(9): 49-51; 1971.* (4 references) (Russian)

Clinical investigations of 53 workers of a polychlorocamphene (toxaphene) manufacturing plant are described. The polychlorocamphene concentrations at different workplaces were 2-10 times greater than the maximum allowable level. Headache, increased fatigue, pain in the cardiac region, and insomnia were reported by 19 subjects. Functional alterations in the nervous system, vegetative dysfunction in 11, and asthenic-vegetative syndrome in 4 cases were determined. Both sinus bradycardia and tachycardia, respiratory arrhythmia, precardiac alterations, disturbed repolarization, hypotonic tendencies, and asymmetric arterial pressure occurred in 17 cases. These symptoms were often accompanied by vegetative dysfunction and were often due to extracardial alterations. Reduced hemoglobin and erythrocyte levels were found. Increased reticulocyte count was determined in nine cases, and reduction of the osmotic resistance of the erythrocytes was seen in 12 cases. The methemoglobin levels fluctuated between 0.17 and 5.7% in 24 cases. Increased rates of erythrocyte sedimentation reaction were observed in 15 cases. Erythrocytes with Heinz bodies were detected in 13 cases. Highly significant differences in the distribution of monochromic anemia, and abnormal levels of hemoglobin, methemoglobin, and erythrocytes with Heinz bodies were determined between two groups exposed to polychlorocamphene permanently and occasionally.

72-2353. Dunayevskiy, G. A. (Inst. of Nutr. Hyg., Kiev, USSR). **Funktsional'noye sostoyaniye organov krovoobrashcheniya u rabochikh, zanyatykh proizvodstvom khlororganicheskikh soyedineniy. [The functional condition of the circulatory organs in workers involved in organochlorine compounds' manufacturing.]** *Gig. Tr. Prof. Zabol. 16(3): 48-50; 1972.* (16 references) (Russian)

Clinical investigations of the functional condition of the circulatory organs in 84 workers involved in the production of organochlorine compounds such as BHC, DDT, methylene chloride, and 2-KF (trichloro benzoic acid isomers) are described. The workplace concentrations were below the sanitary standards. Pains in the cardiac region and stenocardiac pains in some elder subjects occurred. Tachycardia in 19, bradycardia in 35, dilatation of the heart in 20, functional systolic murmur in 26, and damping of cardiac tones in 26 subjects were reported. Dyspnea was found in 23 cases. Hypotension and hypertension occurred in 15 and 28 cases, respectively. EKG tests revealed mainly sinus arrhythmia, sinus bradycardia, and alterations in the intracardiac conductivity in 65 cases. Atrioventricular muscular alterations with predominant semivertical or vertical heart position were determined, as were hyperventilation and impaired adaptation to physical stress. Alterations in the myocardial contractility and reduced rate of ascent of the intraventricular pressure were found in 31 cases. Functional alterations in respiratory organs may be regarded as the primary cause of cardiovascular alterations.

72-2354. Day, B. H. M. (Stauffer Chemical Co., New York, NY 10017). **Disposing of pesticides and containers: CSMA offers guidelines.** *Household Pers. Prod. Ind. 9(8): 36-37; 1972.*

The choice of a pesticide is guided by the information found in newspapers or available at garden centers. It is mandatory that the dealer have a basic knowledge of the products and that the pesticide manufacturer label the product clearly regarding use and precautionary measures for handling. The label, moreover, should be displayed prominently. It is recommended that every pesticide user purchase only enough to serve him for one season, and that the amount introduced into the sprayer be limited to what is needed for one operation. The empty container should be drained and rinsed with several small portions of water, and the rinsings added to the spray mixture. Any dust or granules remaining in the spreader at the completion of the application should be returned to the original container. Pesticides should be stored out of the reach of children, kept locked up, and protected from freezing temperatures. Incineration is considered the best method of disposing of the empty cans.

72-2355. Weston, J. T.; Liebow, A. A.; Dixon, M. G.; Rich, T. H. (Coll. of Med., Univ. of Utah, Salt Lake City, UT). **Untoward effects of exogenous inhalants on the lung.** *J. Forensic Sci. 17(2): 199-279; 1972.* (51 references)

The effects of inhaled toxicants, in particular, solutions of paraquat, are described. Two case histories are given. The clinical symptoms included dyspnea, jaundice, and signs of hepatic and renal failure. The level of the herbicide in the urine of one of the patients was 1.6 ppm thirty days after poisoning, and immediate urinalysis revealed a level of 0.36 mg per 100 ml in the other. The first patient died one month after exposure, with injury to the lungs, liver, and kidneys. Both the

bilirubin and blood urea nitrogen were elevated. Although it has been stated that paraquat is excreted rapidly, it was not in this case. The second patient died one week after exposure. The combination of progressive pneumonia with the syndrome of alveolo-capillary block, in association with jaundice and renal failure, led to the diagnosis of paraquat exposure.

72-2356. Richmond, G. W. (Standard Oil Co. of California, San Francisco, CA 94120). **Pesticides and human poisoning.** *J. Ky. Med. Ass. 70(4): 291-294; 1972.* (4 references)

The synthetic organic chemicals used as insecticides and herbicides are discussed with respect to symptoms of poisoning and treatment recommended. Chlorinated hydrocarbons such as DDT, chlordane, lindane, and dieldrin, in large doses cause central nervous system stimulation followed by depression, collapse, cyanosis, and eventual death. Treatment consists of removal of poison by gastric lavage, induced vomiting, and saline laxatives. There are no specific antidotes. Phosphate esters such as parathion, TEPP, diazinon, dimethoate, malathion, and phosdrin irreversibly suppress cholinesterase. Intense stimulation of structures innervated by the parasympathetic nerves occurs, followed by excessive accumulation of secretions in the respiratory tract. Atropine treatment in large doses is recommended together with 2 PAM. Carbamates such as carbaryl (Sevin) and Bux act similarly to phosphate esters except the cholinesterase inhibition is reversible. Treatment is similar to that for the organic phosphate poisoning. The treatment for herbicide poisoning (paraquat, diquat, 2,4-D, 2,4,5-T) is confined to the removal of the material from the alimentary tract and skin, and symptomatic treatment. There is no known antidote.

72-2357. McEwen, L. C.; Knittle, C. E.; Richmond, M. L. (Bur. Sport Fish. and Wildl., Denver, CO). **Wildlife effects from grasshopper insecticides sprayed on short-grass range.** *J. Range Manage. 25(3): 188-194; 1972.* (27 references)

Although grasshoppers serve as food for many bird and animal species, outbreaks which are highly destructive to vegetation occasionally occur. Pesticides currently recommended for control of grasshopper outbreaks are malathion and carbaryl. In the present study, insecticides were sprayed on test plots in Montana, New Mexico, and Wyoming. The effects on wildlife were determined by means of bird and small mammal censuses, carcass counts, and residue analyses. Applications (in ounces of active ingredient per acre) that killed birds and caused significant population decreases were fenitrothion (9.6 oz), Baythion (phenylglyoxylonitrile oxime *O,O*-diethyl phosphorothioate) (4.6 and 9.3 oz), diazinon (5.0 to 8.0 oz), and toxaphene (16 oz). Applications that caused reductions in bird populations, but without observed bird mortality, were fenitrothion (6.3 oz), aprocarb (3.0-4.0 oz), and Guthion (4.0 oz). Applications without observed direct effects on wildlife were Baythion (2.5 oz), carbaryl (6.4 oz), malathion (6.8 oz), and Mobam (3.0 oz). Mammal deaths resulting from spraying were not seen.

72-2358. Giroud, M. M. (Author address not given). **Les intoxications et toxi-infections alimentaires de l'enfant en milieu rural. Traitement curatif. Conduite a tenir en general. Traitement sur place. Acheminement vers un centre specialise. [Alimentary intoxications and toxic infections of children in rural environment. Therapy. General rules of treatment. Use of special centers.]** *J. Med. Lyon 52: 197-201; 1971.* (French)

The importance of contacting special anti-poison centers is emphasized and the general rules to be followed described. The use of, and contraindications of stomach lavage, induced vomiting, and purgatives are briefly discussed. It is stressed that administration of milk or oil is generally useless in these poisonings and sometimes dangerous – especially in cases of intoxication with fat soluble substances such as DDT, parathion, or phosphorus. Instead, pure activated charcoal or alumina or phosphate gels should be used. Measures to be taken in severe intoxications with respiratory distress, cardio-vascular collapse, shock, or circulatory arrest are delineated: mouth to mouth resuscitation; oxygen therapy; intravenous injection of corticosteroids or adrenaline; cardiac massage.

72-2359. Whitlock, N. W.; Keil, J. E.; Sandifer, S. H. (Sect. of Prev. Med., Med. Univ. of S. Carolina, Charleston, SC 29401). **Pesticide morbidity in South Carolina, revisited.** *J. S. C. Med. Ass. 69(3): 109-112; 1972.* (3 references)

Due to newly enacted pesticide restrictions, increased public awareness of hazards, and greater usage of organophosphates, a survey was taken in South Carolina to examine changes in pesticide morbidity. The survey was conducted through a questionnaire to 1127 physicians who were most likely to be in contact with cases of acute pesticide poisoning. In a 12-month period acute pesticide poisoning was reported in 627 cases. Although this was 55 more cases than a similar 1969 survey, the rates were about the same for the overall state. When the data were analyzed by districts, the highest incidence for both surveys was shown in the same area. Some of the observed increases may be due to the prompt and complete responses from the physicians.

72-2360. Funatsu, I.; Yamashita, F.; Ito, Y.; Tsugawa, S.; Funatsu, T.; Yoshikane, T.; Hayashi, M.; Kato, T.; Yakushiji, M.; Okamoto, G.; Yamasaki, S.; Arima, T.; Kuno, T.; Ide, H.; Ide, I. (Dept. of Pediat., Kurume Univ. Sch. of Med., Kurume, Japan). **Polychlorobiphenyls (PCB) induced fetopathy. I. Clinical observa-**

tion. *Kurume Med. J. 19(1): 43-51; 1972.* (15 references)

Babies born to four mothers who contracted Yusho' (polychlorinated biphenyl (PCB) poisoning due to contaminated rice oil) during their pregnancies displayed typical anomalies which are examined in detail. The anomalies observed constituted a distinct clinical entity, PCB-induced fetopathy. Principal findings were intrauterine growth retardation (small-for-date babies in three of four cases), dark-brown skin pigmentation, abnormal skull calcification in three cases, and facial edema and exophthalmos in three cases. The abnormal pigmentation resembled that seen in Addison's disease, with parchment-like desquamation, particularly in the areas of the genitals, axillae, fingernails, and hair follicles. Hyperpigmentation of mucous membranes of lip, gingiva, palate, and genitalia was also noted, with gingival hypertrophy in three cases and eruption of teeth at birth in two cases. Brown pigmentation of palpebral conjunctivae was accompanied by a cheesy secretion in two cases. The openings of the frontal and occipital fontanelles and the sagittal suture were abnormally wide. Hepatomegaly was noted in one case. The abnormal pigmentation disappeared between the second and the fifth months of life.

72-2361. Doman, I. (Szarvas, Hungary). **Juh Thiodan mergezese. [Thiodan poisoning in sheep.]** *Magy. Allatorv. Lapja 26(6): 342-343; 1971.* (Hungarian)

Cases of Thiodan (endosulfan) poisoning in sheep are reviewed. Several cases of lethal poisoning were observed in suckling lambs. Three-four hours after Thiodan intake on the pasture, the symptoms of poisoning were: lack of appetite, drowsiness, sporadic, chiefly epileptoid and tonic spasms, tremor, and foaming mouth, recurring 5-6 times during the following 3-4 days. The body temperature and pulse during spasms were 38.3-39.1°C and 70-95/min. Histological investigations revealed point hemorrhages on epicardium and spleen capsule; red, slightly edematous mucous membranes in stomach and intestines, particularly in rumen and abomasum; semiacute catarrhal pneumonia; slight lymphocyte and plasma infiltration in the liver. Older sheep with serious poisoning developed amaurosis after one week, amblyopia after three weeks, and full recovery of sight after four weeks.

72-2362. Tovari, Gy. (Jaszapati, Hungary). **Szarvasmarha heveny Thiodan-mergezese. [Acute poisoning by Thiodan in cattle.]** *Magy. Allatorv. Lapja 26(6): 343-345; 1971.* (Hungarian)

Two cases of Thiodan (endosulfan) poisoning in cattle which grazed on a pesticide-sprayed field are described. In acute poisoning, Thiodan irritates the central nervous system and may cause alterations and adiposis in liver and kidney. Irritation, spasm and convulsion, intense perspiration, and greatly dilated pupils were observed in one animal 4-5 hours after the intake of the poison. In the other animal dyspnea and cyanosis, as well as the above symptoms with reduced intensity, occurred 7-8 hours after intake. Both animals recovered after sedatives were injected; no sequelae were observed.

72-2363. Anonymous. **Fetal death from 'safe' pesticide.** *Med. World News 13(19): 42E-42F; 1972.*

A dose of 12mg/kg parathion, injected intraperitoneally in pregnant mice on days 12, 13, or 14 of gestation, killed 90% of the fetuses. The same dose administered on day 8, 9, or 10 killed 27% of the fetuses. The fetal death rate with corn oil vehicle was 12% which was the same as that of controls pretreated with phenobarbital, which stimulates parathion-metabolizing enzymes. Isotopic experiments indicated that tissue levels of parathion were reduced by phenobarbital treatment. DMSO and several other compounds that rapidly stimulate parathion-metabolizing enzymes are being tested as possible drugs to be given at the time of exposure, or immediately afterwards. Work is also being done on the mechanism of placental transfer of various environmental toxicants.

72-2364. Kudo, N. (Kudo Hosp. of Intern. Med., Hirosaki, Japan). **[Studies on the pathological physiology of intoxication caused by agricultural chemicals. Part 1. Relation between serum ChE activity and intoxication by alkyl phosphates.]** *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 21(1): 18-29; 1972.* (17 references) (Japanese)

Clinical studies and serum cholinesterase (ChE) determinations were performed over a six-year period on persons with various histories of exposure to organophosphate pesticides (OP). These included formulators and applicators of OPs, as well as individuals without known insecticide contact. Although wide variations of ChE activity were found in healthy individuals, a ChE activity of less than 0.6 Δ pH should raise the suspicion of organophosphate poisoning. The pseudo (serum) cholinesterase activity and the true (erythrocyte) acetylcholinesterase activity are not always parallel, but serum ChE is useful as a clinical indicator. Changes in serum ChE activity after fenitrothion poisoning follow a different time course from that found after poisoning by the highly toxic parathion. Greater caution in the mixing of organophosphate solutions is advised, not only to prevent dispersion into the environment, but also to prevent direct poisoning. Repeated mass ChE determinations in regions where large quantities of high-toxicity organophosphates have been used may reveal many latent cases of chronic poisoning.

72-2365. Kudo, N. (Kudo Hosp. of Intern. Med., Hirosaki, Japan). **[Studies on the pathological physiology of intoxication caused by agricultural chemicals.**

Part 2. The relation between liver function and intoxication by alkyl phosphates.] *Nippon Noson Igakkai Zasshi (J. Jap. Ass. Rural Med.) 21(1): 30-39; 1972.* (18 references) (Japanese)

The correlation between liver function test results and organophosphate pesticide exposure was investigated in a group of apple growers. Of the liver-function parameters investigated, GOT was most closely correlated with organophosphate exposure, followed by LDH. However, the extent of abnormalities seen in agricultural workers was not as great as that reported for parathion suicides, and no clear correlation with length of exposure existed. In many instances the GOT value was still within the pathological range one month after the last parathion spraying. Positive urine urobilinogen tests seen in some persons could not be correlated with other abnormalities. On the basis of these findings, the possibility of liver damage occurring as a result of repeated contact with organophosphate pesticides cannot be excluded.

72-2366. Mihok, O.; Olcsvary, M.; Papp, E. (Baleseti Belgyogyaszat, Koranyi Frigyes es Sandor Korhaz, Budapest, Hungary). **Foszforsaveszter tartalmu novenyvedoszerekkel tortent sulyos mergezesek klinikuma (Osztalyunk 1969-es statisztikai adatai alapjan). [Clinical treatment of serious cases of phosphorus ester pesticide poisonings. (On the basis of 1969 statistical data).]** *Orv. Hetil. 112(47): 2828-2833; 1971.* (26 references) (Hungarian)

Experiences gained during the clinical treatment of serious poisonings (41 accidental and 16 intentional) with phosphorus ester pesticides are reviewed. The symptoms, induced essentially by released acetylcholine, can be related to three different syndromes. Intense parasympathetic excitation is characterized by increased salivation, miosis, dyspnea, epigastric and substernal pains, colic, intensified peristalsis and bronchial secretion, and increase or decrease in blood pressure. The second syndrome is symptomatically similar to nicotine poisonings. The third syndrome pertains to the central nervous system, may be absent in many cases, and is characterized by convulsions, spasms, areflexia, coma, and serious respiratory troubles. The cholinesterase activity, measured in 44 cases, was within the normal range in 29, mostly accidental, and severely reduced in 16. When administered during the initial, reversible phase of the poisoning, atropine, sometimes overdosed, and Toxogonin are the best drugs for clinical treatment. Toxogonin, which activates the cholinesterase of the central nervous system, may react chemically with cholinesterase when administered in large doses. Major operations to be performed on patients exposed to phosphoric ester pesticides should be preceded by cholinesterase activity determination.

72-2367. Schorn, D. (Dept. of Intern. Med., H. F. Verwoerd Hosp., Pretoria, South Africa). **Parathion poisoning: a case report.** *S. Afr. Med. J. 46(10): 262-265; 1972.* (11 references)

A case of parathion poisoning related to a suicide attempt by a white male who drank more than .50 ml of concentrate is presented. The initial symptoms were loss of consciousness, sweating, and excessive bronchial secretions. Gastric lavage, regular suction of trachea, and atropine therapy were instituted; the patient responded well. A low serum potassium level was increased by infusion of KCl. A pseudo-cholinesterase measurement gave a reading of 8 pH units (normal = 40-110 pH units). About 24 hr after admission a painless pericardial friction rub was detected. A heart block can occur and is the most common cardiac side-effect. In this case, the friction rub disappeared within four days and some of the ECG changes returned to normal before the patient was discharged.

72-2368. Van Der Merwe, C. F. (Dept. of Intern. Med., Univ. Hosp., Groningen, The Netherlands). **The treatment of thallium poisoning: a report of 2 cases.** *S. Afr. Med. J. 46(28): 960-961; 1972.* (7 references)

Thallium, commonly used as a pesticide or rodenticide, often causes accidental (or intentional) poisoning. Its lethal dose is between 8-15 mg/kg body weight. Two cases of thallium poisoning are described. The first case was an attempted suicide by a 26-yr-old girl who swallowed 700 mg of thallium sulphate in two doses. Upon hospitalization 12 hr later, gastric lavage was negative although thallium could be demonstrated pharmacologically. She was treated with 250 mg/kg Prussian blue in four daily doses of 3.75 g in 15% mannitol through a duodenal tube. Some hyperesthesia of the legs and feet developed on the third day together with abdominal discomfort, followed by burning sensations in the feet and pain in the legs and shoulders. On the subsequent days, the pain subsided. There was some hair loss on the 10th day. Prussian blue was stopped on the thirteenth day. The highest thallium excretion in the urine was on the second day (13 mg/24 hr). The second case was a 22-year-old man who swallowed approximately 700 mg of thallous sulphate in a suicide attempt. Upon admission to the hospital, 6 hr later, the gastric lavage showed only a trace of thallium, and the patient was treated in the manner described previously. He showed slight paresthesia and sensory impairment of the toes after four days. This improved and disappeared; hair loss started after two weeks. His thallium excretion in the urine was 3.3 and 3.4 mg/24 hr on the second and third days, respectively. The efficacy of the treatment is thus demonstrated.

72-2369. Misumi, J.; Matsushita, T.; Tomio, T. (Sch. of Pub. Hyg., Fac. of Med., Kumamoto Univ., Kumamoto-shi, Japan). **[Results of health investigations on persons who have engaged in application of low-toxicity organophosphorus pesticides.]** *Sangyo Igaku (Jap. J. Ind. Health) 14(4): 410-411; 1972.* (Japanese)

The health conditions of 12 persons who had engaged in the application of pesticides were investigated to examine the effects of low toxicity organophosphorus pesticides such as fenitrothion and dichlorvos. The investigation was carried out three times, before, during, and after the spray application of an oil solution containing the pesticide. The findings during application were subjective symptoms such as forgetfulness, irritation, nausea, constipation, and sensation of pressure on the chest. Afterwards, abnormal findings included increased concentration of *p*-nitrocresol in urine, coinciding with times of applications; the average amount excreted was 19 ± 4.23 μg/10 ml, versus 9.8 μg/10 ml in controls. Changes in ChE activity, erythrocyte activity counts, and EEG were noted, but no abnormalities were found in other examinations including ophthalmological. It cannot be concluded that all these findings were induced by the organophosphorus pesticides. Further studies are indicated.

72-2370. Rose, H. A.; Rose, S. P. R. (Dept. of Soc. Admin., London Sch. of Econ. and Polit. Sci., London, England). **Chemical spraying as reported by refugees from S. Vietnam.** *Science 177(4050): 710-712; 1972.* (14 references)

Effects of chemical spraying in S. Vietnam were revealed through interviews of 98 refugees in Hanoi. Most of those interviewed had been sprayed repeatedly with different chemicals, but were asked to recount only their latest experience. Eye inflammation, vomiting and nausea, skinburning or reddening, and some longer-term effects including pustules, scabs, and eczema (as with dioxin) were reported frequently. Ninety-two percent experienced fatigue, which in some was prolonged or indefinite. Abortions were reported for humans and domestic animals, and monstrous births were said to occur among the animals. Deaths evidently occurred among humans, domestic animals, fish, and fowl. Effects on crops and trees reported were similar to known effects of various herbicides such as 2,4-D.

72-2371. Bychkovskiy, V. N.; Pisarchik, K. I. (Dept. of Infectious Children's Dis., Crimean Med. Inst., Simferopol', USSR). **Klinika i lecheniye otravleniy fosfororganicheskimi yadokhimikatami (karbofosom) u detey. [Clinical course and treatment of organophosphorus poisoning (carbophos) in children.]** *Vop. Okhr. Materin. Detstva 17(3): 63-67; 1972.* (41 references) (Russian)

The clinical course and symptoms of light, moderate, and severe carbophos (malathion) poisoning in children who had eaten treated cherries are described. Light clinical symptoms included weakness, drowsiness, headache, nausea, and, sometimes, vomiting. Severe headache, salivation, vomiting, diarrhea, and severe abdominal pain, tachycardia and anxiety, pale and wet appearing skin with a scarlet fever-like flushing of cheeks characterized the children with moderate poisoning. High temperatures and delirium, in addition to the above symptoms, occurred in children suffering from severe poisoning. Generalized convulsion states were sometimes associated with overall cyanosis; breathing difficulties were associated with 160 to 180/min pulse rates. Decreased erythrocyte counts (3 to 3.5 million) and hemoglobin (54 to 60 units), and increased leukocyte counts (up to 14,000) characterized the hematologic condition. Diagnosis of organophosphate poisoning should include an analysis of the epidemiologic condition, taking into account the food and specific pesticide utilized in a given region, laboratory tests focusing on blood cholinesterase, and a search for traces of pesticide or its degradation product in the patient's blood and excreta. Treatment includes antidote therapy using atropine and other cholinolytic substances, removal of the toxin from the system, stimulation of cardiovascular and respiratory system, and normalization of the function of the nervous system.

See also 72-2269 72-2270 72-2284 72-2286 72-2314 72-2316 72-2321 72-2402 72-2413

72-2372. Molnar, J. (Sect. of Appl. Toxicol., State Inst. of Occup. Health, Budapest, Hungary). **Comparative pharmacological investigations of some phosphorus esters.** *Acta Physiol. 39(1-3): 275; 1971.*

Studies were performed on three commercially produced insecticides: Terra Systam (dimefox; bis-(diethylamino)-phosphoryl-fluoride); phosdrin (Mevinphos; *O,O*-dimethyl-*O*-(1-methyl-2-carbomethoxy)vinyl phosphate); and DDVP (dichlorvos; 2,2-dichlorovinyl dimethyl phosphate). Compounds were administered to mice subcutaneously in acute toxicity tests, topically for detection of miosis, and intracerebrally to test for the induction of tremors. Dimefox, the compound with the greatest acute subcutaneous toxicity, produced neither miosis nor tremor, whereas both phosdrin and dichlorvos did produce both. This finding suggests the possibility of testing an unknown compound by various administration routes in order to distinguish between directly and indirectly acting phosphorus esters.

72-2373. Anonymous. **No herbicide residues in meat.** *Agr. Res. 20(12): 6; 1972.*

Cattle and sheep were fed silvex, 2,4-D or 2,4,5-T at 300, 1000, or 2000 ppm in their diets to determine whether ingestion of herbicides from treated ranges could result in residues in meat. The lowest level corresponded to the level of forage contamination expected in the first two days after herbicide application, whereas the higher levels could only result from gross misuse. Cattle fed 2000 ppm of silvex for 28 days and slaughtered within 24 hr after the last feeding had residues of 1.0 ppm in the muscle, 3.8 ppm in the fat, 8.4 ppm in the liver, and 24.0 ppm in the kidney. Cattle fed at the same level and slaughtered seven days later had residues of 0.11 ppm in muscle, 0.67 ppm in fat, 0.55 ppm in liver, and 1.13 ppm in kidney. Cattle fed 300 ppm silvex and slaughtered within 24 hours had residues of 0.07 ppm in muscle, 0.66 in fat, 5.73 ppm in liver, and 22.40 ppm in kidney. Both cattle and sheep fed 2,4-D at 2000 ppm had residues of less than 1 ppm in all locations except the kidney when slaughtered within 24 hr after the last feeding. Residues were not detectable in the muscle or liver of cattle fed 2,4-D at 300 ppm and slaughtered after seven days, and only 0.13 ppm were present in the fat and 2.62 ppm in the kidney. Sheep fed 2,4,5-T and slaughtered after seven days showed only traces of residues in the tissues.

72-2374. Clarkson, T. W. (Dept. of Pharmacol. & Toxicol., Univ. of Rochester, Rochester, NY). **The pharmacology of mercury compounds.** *Ann. Rev. Pharmacol. 12: 375-406; 1972.* (145 references)

A comprehensive review (exclusive of the dose-response relationship) of the pharmacology of mercury compounds is presented. Absorption of some mercury compounds is facilitated by the high lipid solubility of several mercurial salts; pulmonary, percutaneous, and gastrointestinal absorption are described. The pattern of organ deposition appears to be related to the toxic effects of various mercurials. Large species differences are seen in exposure to methyl mercury compounds in the red blood cell-to-plasma ratio. The intra-organ distribution in the kidneys and brain has been shown by animal experiments. Attempts to measure the distribution of mercury between subcellular particles are hindered in determining the purity of the cellular particles. Mercury binding sites in tissues, mainly the kidneys and liver, are described. The concentration of mercury in biological fluids is low, and the identification of biocomplexes has been difficult; Rothstein's work on the transport of mercury from blood to tissues is discussed. Mercury excretion mechanisms are reviewed. Biotransformation of organomercurial compounds, as well as elemental and inorganic mercury, is elucidated. In the case of the short chain alkylmercurials, biotransformation may play an important role in determining the rate of excretion from the body. The effects of mercury on biochemical processes have received a great deal of attention, the greatest effort being directed towards elucidation of those changes associated with mercurial diuresis.

72-2375. Tu, C. M. (Res. Inst., Canada Dept. of Agr., London 72, Ont., Canada). **Effect of four nematocides on activities of microorganisms in soil.** *Appl. Microbiol. 23(2): 398-401; 1972.* (10 references)

Dasanit, carbofuran, D-D, and Vorlex were mixed into samples of Delhi loamy sand soil at various rates, and the samples incubated in milk bottles. Substrates were added to certain bottles for examination of ammonification, nitrification, and sulfur oxidation. Plate count data indicated that both bacterial and fungal populations were slightly depressed after the first week with Vorlex at 30 μg/g, D-D at 600 μg/g, carbofuran at 5 μg/g, and Dasanit at 1 and 5 μg/g. Populations returned to the levels found in the control by the eighth week, and in some instances were higher. Ammonium production from added peptone-N increased by 1 to 10% in some nematocide treatments, whereas the fumigants (D-D and Vorlex) temporarily depressed ammonification of nitrogen. With the exception of Dasanit, the nematocides caused a slight, but significant, decrease in sulfur oxidation. Respiration was temporarily depressed by the fumigants, apparently as a result of partial sterilization. The soil pH was not significantly altered following any of the treatments. Increased respiration after recovery from the temporary depression caused by Dasanit and carbofuran may result from the utilization of these materials as nutrients by the soil microorganisms.

72-2376. Prabhu, V. G. (Dept. of Pharmacol., Chicago Coll. of Osteopathic Med., Chicago, IL). **Amphetamine aggregation effect in mice under conditions of altered microsomal enzymes.** *Arch. Int. Pharmacodyn. Ther.*

195(1): 81-86; 1972. (35 references)

The toxicities of *d*-amphetamine in mice under conditions of aggregation and isolation were studied following *in vivo* microsomal enzyme alterations. Pretreatment of mice with SKF 525-A, a potent microsomal enzyme inhibitor, markedly increased the *d*-amphetamine toxicity, whereas phenobarbital and chlordane, the microsomal enzyme inducers, did not significantly decrease it. The possible mechanisms by which SKF 525-A might potentiate the *d*-amphetamine toxicity are discussed. (Author abstract by permission)

72-2377. Hutson, D. H.; Pickering, B. A.; Donninger, C. (Shell Res. Ltd., Tunstall Lab., Sittingbourne, Kent, U. K.). **Phosphoric acid triester-glutathione alkyltransferase. A mechanism for the detoxification of dimethyl phosphate triesters.** *Biochem. J. 127(1): 285-293; 1972.* (23 references)

2-Chloro-1-(2,4,5-trichlorophenyl)vinyl dimethyl phosphate (tetrachlorvinphos) is demethylated by mammalian liver supernatant (-100,000*g*) protein in the presence of GSH (reduced glutathione). GSH acts as an acceptor of the transferred methyl group to form *S*-methyl glutathione. The enzyme that catalyzes this reaction is present in the soluble fraction of liver from mouse, rat, rabbit, and pig at similar activity. The enzyme was purified 45-fold from pig liver, dimethyl 1-naphthyl phosphate being used as assay substrate. Methyl groups are readily removed from most of the substrates studied; ethyl groups are removed at one-fiftieth to one-hundredth of the rate for methyl groups. It is likely that the enzyme plays an important role in the detoxification of the phosphate triester pesticides containing CH_3-O-P groups. (Author abstract by permission)

72-2378. Iyengar, L.; Pandey, M. P.; Venkobachar, C.; Rao, A. V. S. P. (Dept. of Civil Eng., Indian Inst. of Technol., Kanpur, Kanpur 16, India). **Biochemical evaluation of pesticides.** *Biochem. J. 128(1): 39P-40P; 1972.*

In view of the increasing use of pesticides and insecticides in agriculture, the problem of development of resistance, and effects of insecticide combinations, a biochemical evaluation of pesticides was undertaken. The effects of chemicals such as DDT, lindane, aldrin, endrin, malathion, Rogor, parathion, Diazinon, and Thiometon on amylase, catalase, transaminases, proteases, lipases, and dehydrogenases from such different sources as seeds and mosquito larvae were studied. The results indicated that there was a delay or inhibition of germination of some seeds. The inhibitory patterns of some of the enzymes were indicative of the concentrations of the insecticides. Synergistic or antagonistic effects of combinations of pesticides were obtained by using simple techniques. (Author abstract by permission, edited)

72-2379. Raju, K. S.; Rangaswami, G. (Dept. of Microbiol., Univ. of Agr. Sci., Bangalore-24, India). **Studies on microbial degradation of herbicides in soil.** *Biochem. J. 128(1): 40P; 1972.*

The hazards due to cumulative effects of agricultural chemicals, particularly pesticides, added to cultivated soil have been a subject of investigation in recent years. In order to understand their persistence in the soil under tropical conditions, as in India, a series of studies were undertaken in the laboratory on the microbial degradation of herbicides in soil. When four common herbicides, atrazine (2-chloro-4-ethylamino-6-isopropylamino-s-triazine), simazine [2-chloro-4,6-bis(ethylamino)-*sym*-triazine], diuron [3-(3,4-dichlorophenyl)-1,1-dimethylurea] and Tok-E25 (2,4-dichlorophenyl 4-nitrophenyl ether), were applied to the soil, there was a change in the populations of bacteria, actinomycetes, and fungi. Atrazine caused the maximum change. When the soil was enriched with 1000 ppm of the herbicides, several bacteria and fungi resistant to the herbicides were isolated. Some of the fungi and bacteria were able to resist the herbicides at concentrations as high as 7500 ppm, but the actinomycetes were not resistant. Some of the bacteria, fungi, and actinomycetes were able to utilize the herbicides as a source of carbon or nitrogen, and a few were able to grow in artificial media containing the herbicides as the sole carbon and nitrogen source. The growth of the latter organisms was, however, slow in the laboratory media, indicating their low efficiency in utilizing these compounds. Of the four herbicides tested, diuron was relatively the most resistant to microbial degradation. (Author abstract by permission)

72-2380. Gowda, T. K. S.; Patil, R. B. (Dept. of Microbiol., Univ. of Agr. Sci., Bangalore-24, India). **Effect of pesticides applied to the soil on the biological activity of the soil.** *Biochem. J. 128(1): 56P-57P; 1972.*

Two herbicides, simazine [2-chloro-4,6-bis(ethylamino)-6-chloro-*sym*-triazine] and Tok E-25 (2,4-dichlorophenyl *p*-nitrophenyl ether), and two fungicides, Benlate (methyl-1-butylcarbamoyl-2-benzimidazole carbamate) and Lannate (*S*-methyl-*N*-[methylcarbamoyl)oxy]thioacetimidate), were studied at two concentrations for their effect on microbial population, soil respiration, ammonification, and nitrification when applied to the sandy soil of Bangalore. The results indicated that at either concentration none except Benlate had any effect on bacteria. Benlate stimulated the bacterial numbers during the last two weeks of a four-week incubation period. Simazine depressed the actinomycete population in the beginning and stimulated it during the last two weeks. The others did not have any effect on actinomycete population. Fungal population was stimulated by Tok-E-25, whereas Benlate depressed it initially and stimulated it during the last two weeks of incubation. Simazine drastically decreased the soil respiration initially, and thereafter it had

no effect. The others did not affect the respiration. The effect of Benlate at two concentrations on soil ammonification and nitrification rates was studied, with media containing peptone or ammonium sulphate or nitrite. In peptone medium, ammonification and nitrite formation were unaffected but nitrate formation was drastically depressed, resulting in accumulation of nitrite. In ammonium sulphate medium and nitrite medium, Benlate at both concentrations did not have any marked effect initially, but during the latter half of the incubation period, nitrification was gradually depressed or it remained steady at a low rate. (Author abstract by permission)

72-2381. Fisher, D. B.; Mueller, G. C. (Lab. of Neurochem., Nat. Inst. Mental Health, Nat. Inst. Health, Bethesda, MD 20014). **Gamma-hexachlorocyclohexane inhibits the initiation of lymphocyte growth by phytohemagglutinin.** *Biochem. Pharmacol. 20(9): 2515-2518; 1971.* (9 references)

Gammexane (γ-BHC, lindane) is known to inhibit phosphorus turnover in phosphatidylinositol of human lymphocyte cultures. Therefore, lindane was used in elucidating the relationship between the acceleration of phosphatidylinositol turnover and the induction of lymphocyte growth by phytohemagglutinin (PHA). Addition of 1m*M* lindane to cultured lymphocytes incubated with PHA inhibited the enhancement of phosphatidylinositol turnover by 85%. Similarly, lindane inhibited the ability of PHA to stimulate RNA synthesis and initiate DNA synthesis, but had little effect on nonstimulated cultures. The inhibition of lymphocyte phospholipid response by lindane did not take place via interference with energy production since lindane had little effect on glucose conversion. The γ-isomer of BHC failed to affect either phosphatidylinositol turnover or nucleic acid synthesis. These findings support the view that acceleration of phosphatidylinositol turnover is related to the initiation of growth in cultured human lymphocytes by PHA.

72-2382. Matin, M. A.; Kar, P. P. (Ind. Toxicol. Res. Cent., Chattar Manzil Palace, Lucknow, U. P., India). **Central effect of paraoxon in diabetic rats.** *Biochem. Pharmacol. 21(16): 2285-2286; 1972.* (16 references)

The effect of paraoxon on the brain acetylcholine content of diabetic rats is described. The rats were injected with 0.4 mg/kg paraoxon; diabetes was induced by administration of alloxan. Healthy animals with blood sugar levels less than 120mg per cent were used as controls. The acetylcholine content of the brains of normal and diabetic rats was 2.72 and 2.81 μg/g wet weight, not a significant difference; there was no change in diabetic rats receiving insulin. However, paraoxon increased brain acetylcholine content to 4.87 μg/g in control animals and 3.78 μg/g in diabetic rats. This was a significant increase compared with the initial values and a significant difference from each other in the paraoxon effect. When paraoxon was administered simultaneously with insulin (0.5 or 1.0 U/kg) in diabetic animals, the acetylcholine content was 4.33 and 4.82 μg/g, respectively. It is submitted that the permeability of various membranes is impaired by paraoxon, causing a reduced access to brain cholinesterase.

72-2383. Lucier, G. W.; McDaniel, O. S. (Nat. Inst. of Environ. Health Sci., Nat. Inst. of Health, Dept. of Health, Educ. and Welfare, P.O. Box 12233, Research Triangle Park, NC 27709). **Alterations in rat liver microsomal and lysosomal β-glucuronidase by compounds which induce hepatic drug-metabolizing enzymes.** *Biochim. Biophys. Acta 261(1): 168-176; 1972.*

Chlordane, dieldrin, piperonyl butoxide, and benzpyrene, which induce the hepatic microsomal mixed function oxidases and UDP glucuronyltransferases, decreased activity of smooth and rough endoplasmic reticulum β-glucuronidase. The reduction occurred when either *p*-nitrophenyl β-D-glucuronide or phenolphthalein mono-β-glucuronide was used as the substrate. Chlordane or dieldrin pretreatment of rats for three days resulted in a 2.5-fold reduction in endoplasmic reticulum activity; the reduction was less for piperonyl butoxide or benzpyrene. On the other hand, aminopyrine demethylase and UDP glucuronyltransferase were increased 2-fold by chlordane or dieldrin pretreatments. Decreases in microsomal β-glucuronidase activity might be directly or indirectly involved in the induction process since decreases in β-glucuronidase activity are quantitatively similar to increases in activity of the drug-metabolizing enzymes. Lysosomal β-glucuronidase also decreased following pretreatment of rats with inducing agents, but the reduction was less than that observed in the endoplasmic reticulum fractions. Analysis of pH optima, temperature optima, *Km* values, heat denaturation data, and effects of Triton X-100 on activities of various liver fractions suggests that β-glucuronidase from the endoplasmic reticulum and lysosomes have similar properties. (Author abstract by permission)

72-2384. Whitehead, C. C.; Downing, A. G.; Pettigrew, R. J. (Agr. Res. Counc., Poultry Res. Cent., Edinburgh EH9 3 JS, Scotland). **The effects of lindane on laying hens.** *Brit. Poultry Sci. 13(3): 293-299; 1972.* (10 references)

The feeding of lindane in gelatine capsules to laying hens at 12.5 mg/day, equivalent to about 100 ppm in the diet, impaired egg production by 20-30% beginning in the second or third week of feeding. When treatment was stopped after four wk, the egg production returned to its original level within one month. When lindane feeding was continued for six wk or more, birds which went out of lay did not resume production within two months, and the rate of production of the flock

remained at a depressed level. A considerable part of the depression can be accounted for by a dramatic drop in the production of a minority (10 to 20%) of the flock, which appear to be especially sensitive to lindane. No significant decrease of egg shell thickness, egg weight, yolk weight, or hatchability of eggs in the treatment groups were noted.

72-2385. Lutz-Ostertag, Y.; Meiniel, R.; Lutz, H. (Lab. de Biol. Animale, Fac. des Sci., Clermont-Ferrand, France). **Action du parathion sur la sexualite et le developpement de l'embryon de poulet et de caille. [The action of parathion on the sexuality and development of chicken and quail embryo.]** *Bull. Soc. Zool. Fr. 95(3): 620; 1970.* (French)

A commercial preparation of parathion containing 10% active matter produces severe embryonal disorders when applied to chicken or quail eggs. Malformations including lordosis, vertebral fusions, posterior atrophy, crooked claws, and others associated with internal organ lesions are severe enough to prevent hatching. Cultivation of quail embryo testicles in the presence of parathion causes vacuolization of the testicular tubules and selective disappearance of gonocytes and Sertoli cells. Although vacuolization is absent, gonocytes disappear completely in the chicken embryo under the above conditions.

72-2386. Lutz-Ostertag, Y.; Kantelip, J. P. (Lab. de Biol. Animale, Fac. des Sci., Clermont - Ferrand, France). **Action de l'endosulfan sur le tractus genital de l'embryon de poulet et de la caille *in vivo* et *in vitro*. [The action of endosulfan on the chicken and quail embryo genital organs according to *in vivo* and *in vitro* studies.]** *Bull. Soc. Zool. Fr. 95(3): 620; 1970.* (French)

After injection into the eggs, a commercial preparation of endosulfan (35% active matter) alters the genital system of chicken and quail embryos. The testicles become granular in the chicken and acquire a well distinguishable cortex in quails. Chicken embryo gonads cultivated in endosulfan become, in effect, sterilized by a thickening of the albuginea and a total disappearance of gonocytes; mitoses appear to be abnormal. Pflueger's tubes do not form in the female embryo ovary, and the germinal epithelium is devoid of gonocytes.

72-2387. Feroz, M. (London Sch. of Hyg. and Trop. Med., London, England). **Biochemistry of malathion resistance in a strain of *Cimex lectularius* resistant to organophosphorus compounds.** *Bull. WHO 45: 795-804; 1971.* (26 references)

Two strains of bedbugs, one susceptible to malathion and one displaying about 10 X malathion resistance, were tested to determine the applicable mechanism of malathion resistance. Radiolabeled malathion was deposited on the abdominal tergites of tethered bedbugs. At intervals after treatment, the bugs were placed in test tubes and washed to determine the quantity of insecticide remaining on the outside of the body. Homogenates of selected, clean bedbugs were prepared for enzyme and metabolism studies. The two strains did not differ in penetration of malathion; 15-20% of the malathion remained on the outside of the body four hr after application. The acetylcholine (AChE) activity in the susceptible bedbug strain was higher than in the resistant strain; the AChE of the resistant strain was more sensitive to malaoxon. The esterase activities (hydrolysis of 1- and 2-naphthyl acetate) of the two strains were similar. Homogenates of susceptible bedbug strains contained 18% more malaoxon after 1.5 hr of incubation with malathion than resistant strains. The homogenate of the resistant strain produced larger quantities of malathion monoacid, malathion diacid, demethyl malathion, and diethyl mercaptosuccinate. Quantities of malic acid were identical, and amounts of diethyl malate and mercaptosuccinic acid were greater in susceptible strain homogenate. Total hydrolysis by resistant bugs was 17% greater than by susceptible ones.

72-2388. Golovanova, E. N. (Author address not given). **O vliyanii zootsida Gliftora na ptits i vyzyvayemykh im yavleniyakh vtorichnogo otravleniya. [Primary and secondary effects of the rodenticide Gliftor in birds.]** *Byull. Vses. Nauch-Issled. Inst. Zashch. Rast. 7(2): 38-43; 1970.* (Russian)

The effects of the rodenticide Gliftor (difluorohydrine of glycerine plus chlorofluorohydrine of glycerine) were studied on birds. Feeding tests revealed the slow development of a repellent effect of Gliftor mixed with bait in proportions up to 10%. The lethal doses, determined for 14 different species such as goose, wild duck, teal, black kite, windhover, sparrow, chicken, pigeon, crow, rook, magpie, and blackbird, ranged from 500 to 3,000 mg/kg. Gliftor was found to be more toxic in nestlings than in adult birds; no resistance or increased sensitivity to the poison developed over time. Temporary loss of weight was observed in nestlings 1-2 days following the ingestion of sublethal doses. Egg production, fertility, or the development of embryos and nestlings were not affected by sublethal doses. The retention times in eggs and meat of chickens fed diets containing 1-10% Gliftor were three and five days, respectively. Cats fed such eggs and meat died.

72-2389. Platonow, N. S.; Funnell, H. S. (Dept. of Biomed. Sci., Ontario Vet. Coll., Univ. of Guelph, Guelph, Ont., Canada). **The distribution and some effects of polychlorinated biphenyls (Aroclor 1254) in cockerels during prolonged feeding trial.** *Can. J. Compar. Med. 36(2): 89-93; 1972.* (18 references)

The levels of PCB (polychlorinated biphenyls) were determined in various tissues of cockerels. A ration containing 500 ppm of PCB was used in feeding from

the second month of life for up to 12 weeks. By the fourth week of the experiments, body weights of treated birds were significantly lower than those of controls; the treated birds appeared smaller. Liver weights of treated and untreated birds were the same; the liver-to-body weight ratio in treated animals was elevated. Comb and testicle weights of treated birds were significantly below those of controls throughout the experiment; the combs of treated birds did not grow at all during the test period. PCB chromatograms of liver, blood, and brain extracts were slightly modified in comparison with the Aroclor 1254 standard peaks.

72-2390. Gill, G. R.; LaHam, Q. N. (Dept. of Biol., Univ. of Ottawa, Ottawa, Ont., Canada). **Histochemical and radiographic investigations of malathion-induced malformations in embryonic chick limbs.** *Can. J. Zool. 50(3): 349-351; 1972.* (14 references)

Fertile white leghorn eggs were treated with 0.1 ml of a 6% solution of technical malathion, in corn oil, injected into the yolk at 4.5-5 days of development. At nine days of development, the embryos were collected and the limbs amputated, sectioned, and stained with toluidine blue. The forelimbs of malathion-treated embryos showed abnormal development of the radii, lack of chondrogenic tissue, and absence of the ulnae. Metachromasia of the toluidine-stained tissues was uneven, resulting in a "banding effect" in the cartilage. Hind legs of malathion-treated embryos were shortened, most were edematous, and the tibia-femur joint was malformed. Incorporation of injected ^{35}S into chondroitin sulfates in the malformed limbs was weak and uneven, according to radioautographic studies. This indicated that malathion inhibited the synthesis of chondroitin sulfates by the chondroblasts in both forelimbs and hindlimbs. In all limbs from malathion-treated embryos, the chondroblasts were hypertrophic; there were abnormal amounts of ground substance around the cells. The lack of uniform metachromasia indicated at least a partial absence of one or both chondroitin 4- and 6-sulfates. In many malathion-treated limbs, the mesenchyme apparently failed to differentiate into chondroblasts, and any chondroblasts formed were apparently unable to synthesize or secrete ground substance.

72-2391. Ho, M.; Gibson, M. A. (Dept. of Biol., Acadia Univ., Wolfville, N.S., Canada). **Histogenesis of the tibiotarsus in malathion-treated chick embryos.** *Can. J. Zool. 50(6): 771-775; 1972.* (11 references)

Skeletogenesis was followed throughout the incubation period in chicken eggs injected with 0.1 ml of 2% malathion in corn oil on the fifth day of incubation. The malathion-treated embryos were of smaller size than the control (corn-oil injected) embryos of the same chronological age, and all of the malathion-treated specimens exhibited micromelia. A delay in onset of calcification of the tarsals occurred in malathion-treated embryos. Tibiotarsi of malathion-treated chicks showed reduced growth rates and were frequently curved with angulation occurring at the junction of the diaphysis and distal epiphysis. Periosteal ossification, cartilage resorption, and marrow cavity formation progressed more rapidly in treated embryos than in controls. Areas of necrotic cartilage developed in the epiphyses of tibiotarsi in treated embryos, the more extensive necrosis occurring in the distal epiphysis. The necrotic area showed progressive degeneration of chondrocytes, as well as a reduction in the amount of ground substance and in the degree of sulfation of the mucopolysaccharide component. The changes observed are similar to the embryonic abnormalities caused by insulin injection.

72-2392. Cobb, L. M. (Chester Beatty Res. Inst., Inst. of Cancer Res., Royal Cancer Hosp., London, S. W. 3, England). **Tissue specific chemotherapy.** *Cancer Chemother. Rep. 54(6): 375-378; 1970.* (15 references)

The chemical approach to tissue specific therapy for cancer is based on the assumption that it would be possible to exploit differences between a tissue from which a tumor has arisen and other tissues in the host. In routine toxicity trials chemicals frequently are found to have a selectively toxic effect on one tissue. For example, 1,1-dichloro-2-(*o*-chlorophenyl)-2-(*p*-chlorophenyl)ethane (*o,p'*-DDD, TDE, NSC-38721) has a selectively toxic effect on the adrenal cortex, and has been used with some success in the treatment of carcinoma of the adrenal cortex.

72-2393. Kutt, H.; Waters, L.; Fouts, J. R. (Dept. of Pharmacol., Coll. of Med., Univ. of Iowa, Iowa City, IA). **Diphenylhydantoin-induced difference spectra with rat-liver microsomes.** *Chem. Biol. Interactions 2(3): 195-202; 1970.* (10 references)

A type I substrate-induced difference spectrum was observed with the addition of diphenylhydantoin (DPH) to rat-liver microsome preparations. Compared to the change induced by benzphetamine or aniline, this one caused by DPH was relatively slight, and the apparent *Ks* for the DPH-microsome interaction was low. Pretreatment of the experimental animals with hepatic microsomal enzyme stimulating or inducing agents, such as phenobarbital, DPH, DDT, or chlordane, reduced the magnitude of the DPH change produced by 30 to 70%. Treatment with 3-methylcholanthrene or benzpyrene completely abolished the DPH-induced microsomal difference spectrum. *In vitro* addition of phenobarbital, DPH, DDT, chlordane, or 3-methylcholanthrene to hepatic microsome preparations, obtained from nonpretreated animals, reduced the magnitude of the change in a concentration-dependent manner in DPH-induced difference spectra. DPH appears to form a loose, unstable bond with rat-liver microsomes, and may serve as an indicator for the presence of certain drugs or ligands in test preparations.

72-2394. Bridges, B. A.; Mottershead, R. P.; Rothwell, M. A.; Green, M. H. L. (MRC Cell Mutation Unit, Univ. of Sussex, Falmer, Brighton, BN1 9QH, Great Britain). **Repair-deficient bacterial strains suitable for mutagenicity screening: tests with the fungicide captan.** *Chem. Biol. Interactions 5(2): 77-84; 1972.* (19 references)

The mutagenic properties of captan were investigated with a spot test using selected repair-deficient strains of *Escherichia coli*. Such a test not only indicates the presence or absence of mutagenic potential, but also provides information on the type of mutagenic process involved. A substantial portion of the mutagenic activity of captan was shown to result from excisable DNA damage brought about by a volatile degradation product of captan. Larger quantities of this product are produced at alkaline pH than in neutral solutions, probably as a result of hydrolysis. The mutagenic activity of the captan derivative does not depend on the $ExrA^+$ and $RecA^+$ repair functions, in contrast to other excisable DNA damage. A second mutagenic captan derivative is diffusible and produces excisable damage, the mutagenic action of which is Exr^+ dependent. Since most mutagens producing excisable damage are also carcinogenic, captan appears to present a possible carcinogenic hazard if inhaled. Since the serum half-life of captan is only 10 sec, gonadal damage via the blood stream is less likely.

72-2395. Malik, K. (Dept. of Intern. Med., St. Louis Univ. Sch. of Med., St. Louis, MO 63104). **Potentiation by anticholinesterase of the response of rat mesenteric arteries to sympathetic postganglionic nerve stimulation.** *Circ. Res. 27(5): 647-655; 1970.* (25 references)

Changes were investigated in the vasoconstrictor responses of perfused rat mesenteric arteries upon sympathetic postganglionic nerve stimulation after infusion of physostigmine, neostigmine, and diisopropylfluorophosphate (DFP). All three of the drugs greatly potentiated the vasoconstrictor response to nerve stimulation at a frequency of 1/sec. The magnitude of the potentiation decreased with rising frequency to almost nil at 6/sec. The experiments were performed at 30°C. The infusion of neostigmine or DFP did not alter the response to injected norepinephrine, whereas the infusion of physostigmine did potentiate this response slightly. The enhanced response to adrenergic nerve stimulation after administration of anticholinesterase agents was attributed to cholinesterase inactivation. This resulted in increased acetylcholine accumulation and thus the liberation of greater amounts of norepinephrine from the stimulated sympathetic postganglionic fibers.

72-2396. Anonymous. **Thallium poisoning.** *Clin. Toxicol. 5(1): 89-93; 1972.*

A condensed version of a recent report on thallium poisoning, from The Netherlands' Rijks Institute, is presented. Thallium salts are widely used as rodenticides and insecticides and have been successful in human suicides or homicides. In handbooks and most recent literature, the chelating agent dithiocarb is indicated as nontoxic and is recommended as a therapeutic agent in thallium poisoning. This has been proven to be an unjustifiable claim. Although dithiocarb increases the urinary thallium excretion, the blood concentration of the poison is increased. Redistribution of thallium in the brain of animals treated with dithiocarb is due to the lipophilic character of the chelate. Because of this phenomenon and because death after thallium poisoning is primarily caused by the neurological complications, the use of dithiocarb as an antidote should be discontinued. Other chelating agents were also discarded after experimentation, and Prussian blue (ferric ferrocyanide) was found to be effective. Since this agent exerts its effect by way of the gastrointestinal tract, it will work only in the absence of ileus. It seems to reduce the damage to the central nervous system and may prevent death in patients who have ingested 1-2 g of thallous sulfate. Measures to be taken in the treatment of patients with thallium poisoning are detailed.

72-2397. Patocka, J. (J. E. Purkyne Mil. Med. Inst. for Res. and Postgrad. Train., Hradec Kralove, Czechoslovakia). **Kinetics of reactivation of isopropyl-methylphosphonylated bovine erythrocyte acetylcholinesterase by bisquaternary pyridinemonoaldoximes.** *Collect. Czech. Chem. Commun. 36(7): 2677-2682; 1971.* (26 references)

The overall kinetics of cholinesterase reactivation by oximes are characterized by the dissociation constant of the labile intermediary phosphorylated enzyme-reactivator complex and by its decomposition rate constant. These two constants were calculated from the dependence of the apparent reactivation rate constant on the reactivator concentration for 13 different bisquaternary pyridinemonoaldoximes. Taking the bimolecular rate constant as a measure of reactivation effectiveness, all but three of the oximes tested were found to be better reactivators than pralidoxime. Most effective by this criterion were 1-(4-pyridiniumaldoxime)-3-diethylmethylammonium-propane dibromide and 1-(4-pyridiniumaldoxime)-3-trimethylammonium-propane dibromide, which have given good results in the treatment of experimental Sarin intoxication in mice. The results support the hypothesis that the second oxime group in the reactivator molecule is not essential if the second quaternary nitrogen atom is maintained at a proper distance; substitution on this nitrogen affects the reactivation effect.

72-2398. Sanders, H. O. (Author address not given). **Pesticide toxicities to tadpoles of the western chorus frog *Pseudacris triseriata* and Fowler's toad *Bufo woodhousii fowleri*.** *Copeia 2: 246-257; 1970.* (16 references)

Investigations were made on the relative acute toxicities of 16 pesticides to week-old chorus frog tad-

poles and 18 pesticides to 4- and 5-wk old toad tadpoles. LC50s were determined at 24, 48, and 96 hr using static bioassays at 15.5°, without aeration and with the toxicant added to the medium at the beginning of the test. In toad tadpoles the LC50 values ranged from 0.10 ppm for trifluralin to 26 ppm for paraquat. Endrin, the most toxic insecticide studied, produced a 50% mortality at 96 hr at a concentration of 0.12 ppm. The range at 96 hr in chorus frog tadpoles was from 0.028 ppm for carbophenothion to 100 ppm for the dimethylamine salt of 2,4-D. Sensitivity to DDT in tadpoles increased with age. The symptoms of poisoning by all pesticides tested included irritability, followed by a loss of equilibrium, and then death. Concentrations much lower than the LC50 values irreversibly affected the tadpoles. Results correlate well with those of investigations of the same pesticides in adult frogs.

72-2399. Wedig, III, J. H. (Univ. of Michigan, Ann Arbor, MI). **Effects of barbiturates and chlordane on ovulation in the rat.** *Diss. Abstr. Int. 32(8): 4410B; 1972.*

Four possible mechanisms of action were considered for the ability of barbiturates or chlordane to block ovulation in the adult or the pregnant mare's serum gonadotrophin (PMS) treated immature rat: induction of estrogen metabolizing hepatic microsomal enzymes; reduction of the sensitivity of the ovary to luteinizing hormone (LH); impairment of the ability of luteinizing hormone releasing factor (LRF) to release LH from the pituitary; depression of the neural stimulus required for the release of LRF from the hypothalamus. Adult and PMS-treated immature rats were treated chronically with phenobarbital (37 mg/kg, i.p.) or chlordane (25 mg/kg, i.p.) which increased certain drug hydroxylating enzymes in hepatic microsomes up to 10 fold. The adults continued to cycle and ovulate normally during a two week treatment period. Activation of hepatic microsomal enzymes did not inhibit ovulation in the PMS-treated immature rats. Thus, chlordane or phenobarbital did not appear to inhibit ovulation by induction of hepatic microsomal enzyme activity, with resultant changes in the metabolism of LH and/or ovarian steroids. L-3,4,dihydroxyphenylalanine (L-dopa) injected at 1 PM on the afternoon of functional proestrous induced an immediate increase in serum LH in the unanesthetized rats. Pentobarbital anesthesia at 12:30 PM blocked the response to the optimal (25 mg/kg) dose of L-dopa. These results suggest that a dopaminergic mechanism is involved in the release of LH and that barbiturate anesthesia blocks this response centrally. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 72-5007).

72-2400. Ahmad, Z. (Washington State Univ., Pullman, WA). **Selective toxicity of carbophenothion and trichlorfon to the honey bee, *Apis mellifera* Linnaeus and the alfalfa leafcutter bee, *Megachile rotundata* Fabricius.** *Diss. Abstr. Int. 32(8): 4644B-4645B; 1972.*

Selective toxicity of carbophenothion and trichlorfon to the honey bee, *Apis mellifera* Linn. and the alfalfa leafcutter bee, *Megachile rotundata* Fab. was established in dosage-mortality studies using the topical drop method. The LD-50s of trichlorfon for the honey bee, the male leafcutter bee, and the female leafcutter bee were 28.5, 250.0, and 515.0 μg/g, respectively. The LD-50s of carbophenothion were 12.6, 4.3, and 6.2 μg/g, respectively. At LD-50 level trichlorfon was on an average 14 times more toxic to the honey bee than to the alfalfa leafcutter bee. At LD-95 level it was 23 times more toxic. Conversely, carbophenothion was less toxic to the honey bee than to the leafcutter bee and the difference in toxicity was 2.5-fold both at LD-50 and at LD-95 levels. The differential toxicity of trichlorfon to males and females of the alfalfa leafcutter bee was established for the first time. The differential toxicity of trichlorfon may be related to the pH of the body fluids. The pH of the body fluids was measured from the extracts of the insects. The pH of the body fluids of honey bees and alfalfa leafuctter bees were 6.0 and 6.8, respectively. Higher pH of the body fluids should result in a more rapid degradation of trichlorfon in the leafcutter bee than in the honey bee since trichlorfon is known to be unstable at neutral or high pH. Carbophenothion is a relatively stable compound and pH has little effect on its degradation. (Author abstract by permission, abridged. Copies of the thesis of available from University Microfilms, Order No. 72–7630).

72-2401. Chen, P. R. S. (North Carolina State Univ., Raleigh, NC). **Studies on the amidase which hydrolyzes dimethoate.** *Diss. Abstr. Int. 32(8): 4645B-4646B; 1972.*

A simple colorimetric assay method for the determination of amidase activity toward *N*-mono and *N,N*-disubstituted amides was developed. With this new assay method, the study of a sheep liver microsomal amidase was undertaken. This amidase was solubilized by repeatedly freezing and thawing, then purified by hydroxylapatite and benzyl-DEAE-cellulose column chromatography. The final preparation had a specific activity of 7.4 units/mg protein and only one protein band on disc gel electrophoresis. The enzyme has an optimum pH at 9 and a molecular weight, as determined by gel filtration, of 230,000 to 250,000. The enzyme activity is not stimulated by various nucleotides or divalent cations. Various *O,O*-dialkyl, *N*-alkyl and *N,N*-dialkyl analogs of dimethoate were synthesized and their toxicity to mice and houseflies was determined. The *O,O*-diethyl analog of dimethoate was the most toxic compound to houseflies, but it was 10 times more toxic to mice than dimethoate. No selective toxicity was observed with these compounds. The amidase was able to hydrolyze the *N*-alkyl and various *O,O*-dialkyl analogs

of dimethoate. However, no correlation was observed between the relative rate of hydrolysis and toxicity. The amidase was inhibited by Bidrin (dicrotophos), Azodrin (moncrotophos), and dimethoxon. Therefore, it is concluded that the enzyme is unable to hydrolyze phosphates even if they contain an amide group. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 72-3550)

72-2402. Barber, T. A. (Colorado State Univ., Fort Collins, CO). **Influence of pesticides on mule deer rumen bacteria.** *Diss. Abstr. Int. 32(8): 4751B-4752B; 1972.*

A total of nineteen pesticides, most of which were representative of widely used classes of fungicides, herbicides, and insecticides, were tested for inhibitory activity toward mule deer (*Odocoileus hemionus*) rumen bacteria. Effects of the pesticides on *in vitro* rumen bacterial growth were measured by comparing growth in media containing graded concentrations of the chemicals with that in untreated controls. Numbers of viable cells in media were determined by total culture counts in a non-selective medium, and by enumeration of organisms decomposing specific substrates in enrichment media. Effect of pesticides on rumen bacterial metabolism was examined by observing cellulose digestion, cellulase production, and generation of volatile fatty acids (VFA), gas, and acidic end products *in vitro* in various media. Three of the compounds used in the experiments were relatively consistent in their inhibitory activity. Two of these, Mema RM (methoxy ethylmercury acetate) and bordeaux mixture, contain mercury and copper, respectively. The third, 2,4-D, is a synthetic auxin herbicide. Chlorinated organic insecticides, when inhibitory, were effective only at concentrations higher than those likely to result in the rumen from treated forage, and organophosphates were generally characterized by inhibitory activity only at similarly high concentrations. Carbamate compounds and the single nicotinoid tested were rarely effective at concentrations below 100 ppm. Mercurial compounds were, in contrast, commonly inhibitory at levels of 10 to 100 ppm. Levels of many of the tested compounds necessary to inhibit rumen bacterial growth represented *in vitro* doses exceeding the acute oral LD50 for mule deer. On the other hand, the sensitivity of cellulolytics, pure cultures, and VFA production to quantities of pesticide, which might result in the rumen due to treated forage, indicate that a potential for *in vitro* disruption of rumen function exists. (Author abstract by permission, abridged. Copies of the thesis are available from University microfilms, Order No. 72-6422).

72-2403. Brzezinski, J.; Rusiecki, W. (Dept. of Toxicol. and Forensic Chem., Med. Acad., Warsaw, Poland). **The excretion of catecholamines in rat urine related to disyston poisoning.** *Diss. Pharm. Pharmacol. 22(6): 507-511; 1970.* (7 references)

An increase in excretion of adrenaline and noradrenaline in rats occurred following acute oral administration of disyston (disulfoton), a ChE inhibitor, at both 50% and 10% of the LD50. The highest increases were observed one and two days after administration; levels returned to normal by the fourth or fifth day. A dose of 10% LD50 produced an increase of adrenaline and noradrenaline excretion greater than that produced by 20% or 30% LD50. Administration of disulfoton at 5% LD50 every other day resulted in peak increases in urinary excretion of noradrenaline and adrenaline by the 20th day. These results are consistent with the explanation that acetylcholine, owing to its nicotinic action at low concentrations, liberates catecholamines from tissue stores in heart and kidneys.

72-2404. Kocma, E.; Goldman, J. (Dept. of Physics, Med. Acad., Krakow, Poland). **Diethyldithiocarbamate level in the rat brain.** *Diss. Pharm. Pharmacol. 24(2): 147-150; 1972.* (20 references)

A method was developed for the assay of DEDTC in brain, based on previously published methods for DEDTC determination in urine and blood. Recovery of the material from rat brain tissue was 88 ± 3.0%. Following its administration at 125, 250, and 500 mg/kg ip in rats, the DEDTC brain level reached a peak at 30 min, 53.5 μg/kg at the highest dose, and disappeared within two hrs. The concentration peak appears earlier than either changes in brain catecholamine levels or the sedation effect observed by other authors.

72-2405. Brzezinski, J. (Dept. of Toxicol. Chem., Inst. of Biopharm., Med. Acad., Warsaw, Poland). **The effects of poisoning with phosphorus organic insecticides on the catecholamine levels in rat plasma brain and adrenals.** *Diss. Pharm. Pharmacol. 24(2): 217-220; 1972.* (18 references)

Doses corresponding to 40% of the oral LD50 in rats of three organophosphates caused an increase in plasma catecholamine levels, and a depression of levels of adrenaline and noradrenaline in brain and adrenals. These changes were most pronounced with disulfoton, followed by dichlorvos and fenitrothion. Following administration of disulfoton, plasma levels reached a peak about 2 1/2 times normal within one hr; brain adrenaline reached a low about 1/3 normal in two hr; and adrenal adrenaline dropped to almost 1/2 the normal value in 15 min. Less pronounced changes were observed in brain adrenaline and adrenal noradrenaline.

72-2406. Desi, I.; Farkas, I.; Simon, Gy.; Czieleszky, V. (Orszagos Kozegeszsegugyi Intezet, Budapest, Hungary). **A Bromophos, egy foszforeszter, neurotoxikologiai vizsgalata. [Neurotoxicological examination of bromophos, a phosphate ester.]** *Egeszsegtudomany 15(Suppl.): 48-63; 1971.* (26 references) (Hungarian)

Complex psychophysiological, electrophysiologi-

cal, and histological investigations were carried out on female albino rats fed a diet containing 500, 100, 30, and 10 ppm of bromophos over six weeks. Labyrinth tests on animals with normal excitability at first gave better results for the 500 and 100 ppm-groups than for the control group. By the 47th day of the experiment, the performances in all test groups were poorer than in the control group. The alterations in the conditioned reflexes were dose-dependent in the 500, 100, and 30 ppm-groups. Electroencephalographic tests revealed decreases in the total EEG spectrum and all its wave components in 500 ppm-doses, and increases in the total spectrum and in the amplitude of most of its components in 100 ppm-doses. The alterations in α and γ components were negligible. Stroboscopic signals of 11 c/s frequency caused minor changes in the electroencephalograms in the 100 ppm-group. While no differences between the test and control groups regarding body weight were observed, livers and kidneys in the 500 ppm-group were significantly heavier than in the control group, and also the brain dry content was higher in the former group. Cholinesterase activity was reduced only by 500 and 100 ppm doses. Granular alteration of liver cells from 500 ppm-doses was observed in three cases.

72-2407. Popova, G. V. (Central Lab. of Nature Preservation, USSR Min. of Agr., Moscow, USSR). **Gematologicheskiye pokazateli pri otsenke toksichnosti pestitsidov dlya ryb. [Hematological indexes during an evaluation of the toxicity of pesticides for fish.]** *Eksp. Vod. Toksikol. Mater. Vses. Simp., 1st: 19-29; 1970.* (Russian)

Alterations in the blood picture of ide during chronic poisoning with diuron and Propanide (propanil) were investigated. Hematological examinations of fish kept in water containing diuron in concentrations of 0.4 and 0.2 mg/l revealed strong decrease in both hemoglobin content and erythrocyte count, acute hypochromic anemia, poikilocytosis, and inhibited erythropoiesis on the third day of the experiment. While the hemoglobin and erythrocyte levels normalized by the 10th day, pathological erythrocyte division, irreversible alterations in the cytoplasm and karyoplasm, macrocytosis, and intensified hemolysis were observed. Hemolysis, beginning vacuolization of the cytoplasm, and focal hemorrhages in the liver and spleen were revealed on the 20th day, where both the metabolism and the growth of the fish were suppressed. The mortalities in the groups exposed to concentrations of 0.4 and 0.2 mg/l after 75 days were 67% and 52%, respectively. Propanide, applied in a concentration of 0.05 mg/l in another experiment, fully metabolized by the tenth day. Hematological investigations on the third day revealed decreases in the hemoglobin and erythrocyte levels. While these values normalized by the tenth day, reduced hematocrit value, intensified hemopoiesis, and increased number of fresh erythrocytes were observed. Elimination of hemoglobin from the erythrocytes, beginning macrocytosis, vacuolization in the cytoplasm, and the formation of some anuclear cells due to pathological erythrocyte division were determined. Normal erythrocyte count, intensified hemolysis and cytokaryolysis were found on the tenth day. Chemical hemoglobinolysis, and deformation and corrugation of the colorless erythrocytes were observed on the 20th day. While the fish were kept in poisoned water only over 15 days, the mortality on the 60th day was 20%. Radical, irreversible alterations in the blood and inner organs of the surviving fish were determined.

72-2408. Komarovskiy, F. Ya. (Inst. of Hydrobiol., Ukrainian SSR Acad. of Sci., Kiev, USSR). **Vliyaniye Diurona na fraktsionnyy sostav belkov syvorotki krovy ryb. [Effect of diuron on the fractional composition of fish serum protein.]** *Eksp. Vod. Toksikol. Mater. Vses. Simp., 1st: 30-31; 1970.* (Russian)

The effects of diuron on the fractional composition of blood serum protein in roach and ide were studied by electrophoresis. The fish were kept in water containing 0.2 and 2.4 mg diuron/liter for 75 days. The investigations revealed quantitative changes in the metabolism, particularly of serum proteins, from even small concentrations of diuron. The increase in the serum protein content was due to the increase in the total globulin content (×12.6% for α-globulin and ×39.9% for β-globulin). The rates of the reduction in the albumin and γ-globulin contents were 11.2% and 36.3%, respectively. The above changes may be due to dysfunctions in the protein production in the liver.

72-2409. Metelyev, V. V.; Grishchenko, L. I. (All-Union Exp. Vet. Inst., USSR). **Toksikologiya, klinika, patogenez i diagnostika otravleniya ryb pestitsidami iz gruppy FOS (TKhM-3, fosfamid, MNF) i proizvodnymi karbaminovoy kisloty (sevin). [Toxicology, clinical aspects, pathogenesis and diagnosis of organophosphate (TKhM-3, phosphamide, MNP) and carbamate (Sevin) poisoning.]** *Eksp. Vod. Toksikol. Mater. Vses. Simp., 1st: 36-38; 1970.* (Russian)

Studies on the effects of trichlorometaphos-3 (ronnel), phosphamide (dimethoate), methylnitrophos (fenitrothion), and Sevin (carbaryl) on carp are reviewed. The LC50 values of ronnel, dimethoate, fenitrothion, and carbaryl in 48 hour-exposure were 220, 40.3, 15.2, and 28.5 mg/l, respectively. Initial stimulation followed by depression, paralysis, and comatose condition were observed during poisoning. Stasis in inner organs and cerebrum, general anemia, pale gills, and occasional hydremia were determined in chronic poisoning. Organophosphorus compounds produced alterations in the liver (granulation, vacuolization, and necrobiosis of liver cells), the gills (toxic edema, dystrophy, and necrobiosis of the respiratory epithelium), the cerebrum (corrugation and lysis of the neurons of the medulla oblongata and of thalamus nuclei), and in the kidney and spleen (increase in the reticulocyte and histiocyte count, and reduction in the hemosiderin content). Major alterations in the leukocytes were determined. Increase in the

neutrophilic cell count by 160% due to fenitrothion was measured, as well as increases in the monocyte, polymorphonuclear, and neutrophilic cell counts by 270, 400, and 750%, and decreases in the lymphocyte count by 140% from ronnel. Carbaryl and dimethoate caused similar changes in the blood picture. Disturbed carbohydrate metabolism due to fenitrothion and dimethoate was observed. Disturbed gaseous metabolism and inhibition of the peroxidase and acetylcholine esterase activities due to sublethal doses of all compounds investigated were determined.

72-2410. Lipp, J. A. (Biomed. Sect., Defence Res. Estab. Suffield, Ralston, Alberta, Canada). **Effect of diazepam upon soman-induced seizure activity and convulsions.** *Electroencephalogr. Clin. Neurophysiol. 32(5): 557-560; 1972.* (16 references)

The effects of the anticonvulsant drug, diazepam, upon the seizure activity and convulsions induced by the organophosphorus cholinesterase inhibitor, soman, were observed in monkeys with chronically implanted cortical and subcortical electrodes. The diazepam was administered when the EEG reflected seizure activity and convulsions occurred. Seizure activity decreased immediately, and all convulsions were abolished upon diazepam administration. Atropine, when used alone, failed to control the seizure activity or convulsions. The animals were comatose for varying periods after the diazepam administration. The EEG exhibited low voltage fast activity, characteristic of diazepam. All surviving animals were alert the following day, but exhibited some muscular weakness. Their EEGs were similar to the control record. The combination of diazepam and atropine raised the LD50 by a factor of two.

72-2411. Coleby, A. W. P.; Reynolds, H. T.; Metcalf, R. L. (Dept. of Entomol., Univ. of California, Riverside, CA 95202). **Effects of environmental factors on uptake, translocation, and degradation of a systemic phosphonate insecticide in cotton plants.** *Environ. Entomol. 1(2): 129-136; 1972.* (12 references)

The uptake, translocation, and degradation of *O*-methyl-*O*-*p*-methylthiophenyl methylphosphonothioate in cotton under various environmental conditions was studied using radiochemical and bioassay techniques. Lengthening the photoperiod from 10 to 14 hr increased the rate of ^{32}P uptake and translocation, improved the insecticidal activity within the plant parts, and accelerated the degradation of the insecticide. Further lengthening of the photoperiod to 24 hr caused a downward turn in these quantities, presumably as a result of disruption of the plant physiological functions. High humidities retarded the uptake and degradation of the insecticide, whereas increases in temperature enhanced these processes. The degradation in each case was determined via the quantity of radioactivity converted into water-soluble products; previous studies had shown that only the chloroform-soluble products, and not the water-soluble products, retained toxic (i.e., insecticidal) activity.

72-2412. Stenger, R. J.; Johnson, E. A. (Dept. of Pathol., New York Med. Coll., New York, NY 10029). **Modifying effect of 3-amino-1,2,4-triazole on phenobarbital-induced changes in rat liver.** *Exp. Mol. Pathol. 16(2): 147-157; 1972.* (31 references)

Rats were given intraperitoneal injections of phenobarbital with or without aminotriazole (amitrole) on two successive days. The phenobarbital-pretreated animals showed a marked decrease in zoxazolamine paralysis time compared to controls, whereas the paralysis time in the phenobarbital + aminotriazole treated group was reduced by about two-thirds. Hepatic microsomal cytochrome P450 was markedly elevated in phenobarbital-injected rats at 48 hr, but only slightly increased in the combination-treated group. Since this substance is principally increased by *de novo* synthesis of microsomal enzymes and membranes, aminotriazole can be assumed to inhibit this synthesis. The increases in liver weight and hepatocellular smooth-surfaced membranes produced in the two experimental groups were substantial and equivalent. However, animals pretreated with phenobarbital showed marked enhancement of carbon tetrachloride toxicity, whereas the hepatotoxicity of carbon tetrachloride in the combination-treated rats was similar to that of the controls. Thus the difference in enhancement of carbon tetrachloride toxicity as a result of the two treatments appears to be due to differences in effects on specific drug-metabolizing enzymes rather than on structural factors.

72-2413. Bonsignore, D.; Scelsi, R. (Istituto di Med. del Lavoro, Univ. di Genova, Genoa, Italy). **Intossicazione da tallio. [Thallium-induced poisoning.]** *Folia Med. (Naples) 53: 188-204; 1970.* (48 references) (Italian)

A review of thallium properties, toxicity, metabolism, and poisoning treatment is presented. An highly toxic metal (35 mg/kg of the acetate is lethal to man), thallium can penetrate respiratory, digestive, or cutaneous systems. It is deposited in tissues and is excreted in small quantities via the urinary and gastrointestinal tract and through skin and falling hair. However, the remaining quantity inhibits cell reproduction *in vitro* and appears to interfere with DNA synthesis and mitosis. Since the cells of the nervous system are the most susceptible, the pathogenosis of thallium poisoning seems to be related to an SH group affinity. Diagnosis should include an analysis of urine, skin, and hair samples. Therapy is based on two chelating agents, BAL (2,3-dimercaptopropanol) and EDTA. However, at the stage of polyneuritic symptoms, prognosis is unfavorable.

72-2414. Onuma, S. (Dept. of Pharmacol., Hirosaki Univ. Sch. of Med., Hirosaki, Japan). **[Studies on toxicity of parathion used with lead arsenate.]** *Hirosaki Igaku (Hirosaki Med. J.) 23(1): 43-55; 1971.* (17 references) (Japanese)

The possible potentiation of parathion toxicity by lead arsenate was studied. In an acute study, rabbits received subcutaneous injections of parathion, 2.5 mg/kg; lead arsenate, 50 mg/kg; or 2.5 mg/kg parathion plus 25 mg/kg lead arsenate. Serum cholinesterase (ChE) activity decreased appreciably in the parathion-treated group after the injection and slowly returned to normal. Lead arsenate-treated animals displayed a slight, transient drop in ChE activity. Inhibition of ChE was most severe and prolonged in combination-treated animals; one of the rabbits in this group died. In subchronic experiments with twice-weekly injection of pesticides at one-tenth the rate in the acute toxicity studies, decreases in serum cholinesterase and erythrocyte acetylcholinesterase (AChE) were correlated with parathion treatment. Higher AChE activities tended to occur in animals receiving lead acetate. No changes in GPT or electrolyte levels were noted, but GOT was elevated in animals receiving parathion. Blood electrolytes remained unchanged. Lead was detected in the blood of animals receiving lead acetate after two wk, but no toxic symptoms developed. (From author abstract)

72-2415. El-Aaser, A.-B. A.; Reid, E.; Stevenson, D. E. (Cancer Inst., Fac. of Med., Univ. of Cairo, Cairo, Egypt). **Alkaline phosphatase patterns in dieldrin-treated dogs.** *Hoppe-Seyler's Z. Physiol. Chem. 353(4): 667-673; 1972.* (28 references)

Observations suggest that the liver is the main source of serum alkaline phosphatase in normal dogs or in dieldrin-treated dogs; treated animals had increased levels of the enzyme in serum and liver. The intestinal enzyme was found to be sensitive to borate. A comparison of activities of the isoenzymes after heat treatment or exposure to borate, urea, or taurocholate gave positive evidence, as did results with different substrates, that the serum enzyme is largely non-intestinal in origin. Activity values with *p*-glycerophosphate and β-naphthyl phosphate showed a similarity between liver and serum enzymes: cellulose acetate electrophoresis revealed two bands for serum alkaline phosphatase, one corresponding to that obtained from liver and the second, fainter band, similar in position to the kidney enzyme or one of the intestinal enzymes. Phenobarbitone treatment seems to give the same serum pattern as dieldrin treatment. Another plasma-membrane enzyme, 5′-nucleotidase, which rises with liver damage in humans, was not significantly altered by dieldrin administration. Alkaline phosphatase from urine of dieldrin-treated dogs was similar to the intestinal enzyme.

72-2416. MacFarlane, R. B.; Glooschenko, W. A.; Harriss, R. C.* (Dept. of Oceanog., Florida State Univ., Tallahassee, FL 32306). **The interaction of light intensity and DDT concentration upon the marine diatom, *Nitzschia delicatissima* Cleve.** *Hydrobiologia 39(3): 373-382; 1972.* (13 references)

A concentration-dependent reduction in photosynthesis/unit chlorophyll *a*, measured by ^{14}C incorporation, was observed when the marine diatom, *Nitzschia delicatissima* Cleve was exposed to DDT for 24 hr. Increasing the light intensity increased photosynthesis and also the response to DDT. The possibility of DDT resistent individuals within the population, or too short a time for DDT to completely inhibit carbon fixation in all cells, may explain the fact that above 220 ppb DDT, there was no apparent change in photosynthesis/mg of chlorophyll *a* at all light intensities, though some carbon was still assimilated. The chlorophyll *a* concentration decreased at increasing light intensities and, in general, increasing DDT concentrations. Above 220 ppb DDT chlorophyll *a* concentration was not altered. Exposure to 9.4 ppb DDT resulted in much smaller chloroplasts which were spherical rather than ovate. At a concentration of 1000 ppb the chloroplasts were completely disassembled. The results suggest that the effect of DDT on photosynthesis is probably due to its high lipid solubility. Since the photosynthetic mechanism is located on lipid-protein membranes, spatial disruption could reduce photosynthetic output. Also, DDT could reduce the high rate of carbon fixation occurring during periods of high light intensity under natural conditions and greatly affect daily carbon uptake. Lowest concentrations used in this study were about three times those of heavily polluted waters and 100 times those reported in an estuarine study.

72-2417. Boparai, M. S.; Varma, R. N. (Dir. General, Armed Forces Med. Serv., Min. of Defense, New Delhi, India). **Field evaluation of diethyltoluamide (Deet) as a mosquito repellent.** *Indian J. Med. Res. 59(3): 504-509; 1971.* (10 references)

In field tests in which Deet (25%) was found to be a highly effective mosquito repellent, preparations with vanishing cream and with vanishing cream containing lanolin, produced no adverse user reaction. Preparations containing vaseline induced excessive perspiration in nearly 75% of the users; those containing lanolin left an oily layer on skin and produced excessive perspiration in 25% of the subjects.

72-2418. Crookshank, H. R.; Smalley, H. E.; Radeleff, R. D. (U.S. Dept. of Agr., Agr. Res. Serv., Vet. Sci. Res. Div., College Station, TX 77840). **Effect of prolonged oral administration of activated charcoal and of ronnel on the well-being of sheep.** *J. Anim. Sci. 34: 322-325; 1972.* (4 references)

No significant changes were observed in blood serum level or urinary excretion of total calcium, copper, iron, magnesium, inorganic phosphorus, potassium, sodium, zinc, creatine, uric acid, and urea nitrogen following exposure to 5% activated plant charcoal in the diet alone, or in combination with ronnel at 1,000 ppm. Similarly, a biweekly drench of charcoal alone or in combination with the ronnel diet had no significant

effect on these parameters, although within all groups considerable variation was seen. Serum alkaline phosphatase and total protein levels, urine pH, and 24-hr urine volume were not affected. Addition of charcoal or ronnel alone to the diet decreased feed intake and efficiency, but the effects were not additive. Weight changes were similar between groups with one exception. The group fed ronnel in the diet showed a slight weight loss from the fourth to ninth wk while other groups gained weight. Animals fed charcoal in the diet had charcoal particles in the lungs upon necropsy. No instances of pneumonia due to inhalation of particles appeared; no inflammatory cells or exudate were noted in the lungs examined. The study indicates that a charcoal drench could probably be used safely to lower pesticide residues.

72-2419. Johnson, Jr., J. C.; Bowman, M. C. (Anim. Sci. Dept., Coastal Plain Sta., Tifton, GA 31794). **Responses from cows fed diets containing fenthion or fenitrothion.** *J. Dairy Sci. 55(6): 777-782; 1972.* (12 references)

Eight diets,each spiked with 0, 25, 50, or 100 ppm of either fenthion or fenitrothion,were each fed to pairs of lactating Jersey cows for 28 days. Dietary fenthion was associated ($P < .05$) with feed intake. Cholinesterase activity of cows fed 25, 50, and 100 ppm fenthion was depressed ($P < .05$) 39, 70, and 81% compared with control cows; however, milk production was not affected. Consumption of diets containing fenitrothion did not depress ($P > .05$) feed intake, milk production, or blood cholinesterase activity. Total peak residues consisting of fenthion, its sulfoxide and sulfone, and the sulfoxide of the oxygen analog at seven-day intervals in milk from cows fed the 25, 50, and 100 ppm diets averaged .016, .049, and .009 ppm; total residues in feces consisting of fenthion and its sulfoxide averaged from .042 to .308 ppm. Neither fenthion nor its oxygen analog were in urine, but totals of the sulfoxide and sulfone of fenthion and its oxygen analog averaged from .43 to 1.05 ppm. Milk, urine, and feces from cows fed as much as 100 ppm dietary fenitrothion contained neither fenitrothion, its oxygen analog, nor its cresol; but the amino analog of fenitrothion in milk, urine, and feces of cows fed the 25, 50, and 100 ppm diets averaged .002 to .017, 4.64 to 35.6, and .19 to .80 ppm. Seven days after feeding of diets containing fenthion or fenitrothion was terminated, residues could not be detected in milk, urine, or feces from any cow. (Author abstract by permission)

72-2420. ,McClure, G. W. (Boyce Thompson Inst. for Plant Res., Yonkers, NY 10701). **Degradation of phenylcarbamates in soil by mixed suspension of IPC-adapted microorganisms.** *J. Environ. Qual. 1(2): 177-180; 1972.* (8 references)

A mixed suspension of microorganisms containing at least seven tentatively identified genera was derived from a liquid mixture of soil and IPC. This suspension, when applied to nonsterile greenhouse soil flats, markedly reduced or eliminated the toxicity of the phenylcarbamates IPC, CIPC, and Swep to several test plant species. The suspension of microorganisms was effective in the soil for between two and three months. These findings have implications for the degradation of chemicals resistant to the native soil population. (Author abstract by permission)

72-2421. Collins, J. J. (Res. Branch, Ontario Dept. of Lands and Forests, South Baymouth, Ont., Canada). **Introduction of kokanee salmon (*Oncorhyncus nerka*) into Lake Huron.** *J. Fish. Res. Bd. Can. 28(12): 1857-1871; 1971.* (28 references)

An experimental introduction of kokanee salmon (*Oncorhynchus nerka*) into Lake Huron from egg stocks obtained from British Columbia and several western states of the United States began in 1964. From 1964 to 1969, about 5.5 million kokanee (eggs, fry, and fingerlings) were planted. Estimated minimum returns of adults were 9000, 1200, and 4000 in 1967, 1968, and 1969, respectively. Although most of the returns were recorded near planting sites, substantial numbers moved into other areas, in some instances spawning in streams that were not planted. Apparently, most kokanee matured in their 3rd year of life (2+) and their lengths ranged from 18 to 49 cm. Adult kokanee fed mainly on insects and plankton during August and September. Aerial forms of insects predominated in South Bay kokanee. Dieldrin and DDT residues were moderate, averaging between 0.012 and 0.046 ppm dieldrin and 0.226 and 1.242 ppm for DDT in whole tissue samples. Data from South Bay show that the principal species found in association with kokanee were alewife and smelt. The diet of alewife in August indicated possible competition with kokanee. (Author abstract by permission, abridged)

72-2422. Steinberg, M.; Cole, M. M.; Miller, T. A.; Godke, R. A. (Toxicol. Div., US Army Environ. Hyg. Ag., Edgewood Arsenal, MD 21010). **Toxicological and entomological field evaluation of Mobam and Abate powders used as body louse toxicants (*Anoplura: pediculidae*).** *J. Med. Entomol. 9(1): 73-77; 1972.* (8 references)

In field tests conducted at the Republic of Korea's Army Disciplinary Center at Pusan, single applications of formulations of 2% Mobam or 2% Abate in pyrax powder were found to be as safe and effective as louse toxicants as the standard 1% malathion in inert powder. Over 94% control was achieved for 25 days when 56.7 g of the material was applied from a shaker can to test subjects and bedding or 33.9 g was applied to the clothed subject from a power delouser. Serum and whole blood ChE, blood urea nitrogen, LDH, SGOT, and SGPT

of subjects receiving Abate, malathion, or pyrax powder treatment indicated no depression of ChE activity, no changes in kidney or liver function, and no damage to skeletal muscle or myocardium. Previously, 5% Mobam did not affect these parameters. No skin irritation or other symptoms were observed that could be attributed to the treatments.

72-2423. Hobbiger, F.; Lancaster, R. (Dept. of Pharmacol., Middlesex Hospital Med. Sch., London WIP 6DB, England). **The determination of acetylcholinesterase activity of brain slices and its significance in studies of extracellular acetylcholinesterase.** *J. Neurochem. 18(9): 1741-1749; 1971.* (21 references)

AChE activity in intact slices of the temporoparietal region of rat brains was only a small fraction of that obtained when a homogenate of the slice was assayed. With increasing substrate to weight ratio of slices, and with an increase in substrate concentrations, the fraction increased. When rats were treated with 15 μmol of atropine/kg ip followed by 2.5, 5, 10, or 20 μmol of DFP/kg, inhibition of AChE in slices was less pronounced than inhibition recorded for homogenates of the slices. Results were similar when rats were injected with paraoxon. Since addition of 5m*M* ACh for protection of enzyme sites against free inhibitor did not affect the level of inhibition, greater inhibition in homogenates cannot be attributed to free inhibitor reaching enzyme sites during homogenization. It was found that in pretreated rats the ratio of AChE activity of slices to AChE activity of homogenates increased with increasing substrate concentration. Most of the substrate was found to reach the slice on the cut surface. It appears that under anaerobic conditions substrate diffusion into the slices is a function of substrate and enzyme concentrations, and the method is not useful as a measure of extracellular AChE.

72-2424. Peters, D. A. V.; Hrdina, P. D.; Singhal, R. L.; Ling, G. M. (Dept. of Pharmacol., Univ. of Ottawa, Ottawa, Canada). **The role of brain serotonin in DDT-induced hyperpyrexia.** *J. Neurochem. 19(4): 1131-1136; 1972.* (16 references)

Five hr after administration of 600 mg/kg *p,p'*-DDT in rats, brain stem serotonin increased 44%, while levels of 5-hydroxyindoleacetic acid (5-HIAA) remained unchanged. DDT produced a significant rise in serotonin in rats pretreated with pargyline, but had no effect on pargyline-induced decreases in 5-HIAA. No changes were observed in monoamine oxidase, tryptophan hydroxylase, and 5-hydroxytryptophan decarboxylase in brain stem of rats receiving DDT. Treatment with DL-*p*-chlorophenylalanine decreased the levels of 5-HIAA and serotonin, abolished the DDT-induced increase in 5-HIAA, and suppressed the neurotoxic symptoms and rise in body temperature observed with the pesticide alone. Treatment with DL-6-fluorotryptophan, a more specific inhibitor of serotonin synthesis, inhibited the DDT-induced increase in 5-HIAA levels and reversed the hyperpyrexia observed, but did not influence the occurrence of tremor and convulsions. The data suggest that the turnover rate of brain serotonin may underlie the hyperpyrexia induced by *p,p'*-DDT.

72-2425. Kutt, H.; Waters, L.; Fouts, J. R.* (Dept. of Pharmacol., Med. Labs., Coll. of Med., Univ. of Iowa, Iowa City, IA 52240). **The effects of some stimulators (inducers) of hepatic microsomal drug-metabolizing enzyme activity on substrate-induced difference spectra in rat liver microsomes.** *J. Pharmacol. Exp. Ther. 179(1): 101-113; 1971.* (13 references)

Studies were made on *in vitro* exposure to or pretreatment with diphenylhydantoin (DPH), phenobarbital, DDT, or 3-methylcholanthrene (3-MC) on the production of difference spectra and how it is affected in rat liver microsome suspensions by adding DPH, phenobarbital, benzphetamine, or aniline. Most of the interactions recorded could be explained by ligand competition for microsomal binding sites. More strongly binding ligands (benzphetamine, aniline) were able to displace weaker ones (DPH, phenobarbital, or DDT). Measurements of residual inducer in microsomes were obtained from inducer-pretreated animals. These indicate that many of the changes in microsomal difference spectra which appear to be caused from enzyme induction may actually result from the presence of residual inducer in the microsomes.

72-2426. Stevens, J. T.; Stitzel, R. E.*; McPhillips, J. J. (Dept. of Pharmacol. West Virginia Univ. Med. Center, Morgantown, WV 26506). **Effects of anticholinesterase insecticides on hepatic microsomal metabolism.** *J. Pharmacol. Exp. Ther. 181(3): 576-583; 1972.* (29 references)

Parathion, paraoxon, malathion, disulfoton, and carbaryl, administered to mice at 0.5 LD50, prolonged the hexobarbital sleeping time determined 1 hr after pesticide administration; schradan did not. An impairment of hexobarbital metabolism, rather than inhibition of cholinesterase or alteration of brain sensitivity to the barbiturate, appears to cause the effect. Only those insecticides which inhibited hexobarbital oxidation *in vitro* prolonged sleeping time. These also, with the exception of schradan, depressed the microsomal metabolism of aniline and ethylmorphine in the mouse. Paraoxon enhanced aniline hydroxylase activity in mouse, rabbit, rat, and dog. Malathion and carbaryl inhibited hexobarbital and aniline metabolism in the studied species, whereas drug metabolism rates were not substantially affected by schradan. The inhibition kinetics were influenced by both substrate and insecticide structure. Pretreatment of mice with tolbutamide or bishydroxycoumarin potentiated carbaryl toxicity.

72-2427. Izquierdo, J. A.; Jofre, I. J.; Acevedo, C. (Catedra de Farmacol. Exp., Fac. de Farmacia y Bioquimica, Buenos Aires, Argentina). **Effect of disulfiram and ascorbic acid on catecholamine content in rat brain.** *J. Pharm. Pharmacol. 24(4): 330-332; 1972.* (14 references)

A Letter-to-the-Editor reports that disulfiram, which is reduced to DEDTC *in vitro* in the presence of ascorbic acid, increased dopamine and decreased noradrenaline content after two hr, peaking at four hr in the cortex, cerebellum, diencephalon, mesencephalon, and pons-medulla oblongata of rats. Brain noradrenaline returned to normal in 72 hr. When ascorbic acid was also administered, at 20 min before decapitation, the responses were increased. Only in animals given disulfiram 72 hr before decapitation did ascorbic acid produce a significant increase in noradrenaline levels. Similar effects were observed in mice.

72-2428. Moy, P. L.; Ebert, A. G. (Pharmacol. Dept., Int. Miner. and Chem. Corp., Libertyville, IL 60048). **Microbial degradation of 2,3,5-triiodobenzoic acid in soil.** *J. Pharm. Sci. 61(5): 804-805; 1972.* (9 references)

The fate of 2,3,5-triiodobenzoic acid (TIBA) in soil was investigated by incubation of the ^{14}C-labeled compound with soil at two different moisture levels and two different concentration levels. One set of soil samples had been previously sterilized. Over a period of 51 wk, more than 80% of the radioactivity added to the soil was accounted for as evolved $^{14}CO_2$. The remainder was apparently lost due to intermittent sampling. Almost no $^{14}CO_2$ was released by the sterilized soil samples. Acetone extraction and chromatography of soil samples incubated with 1-^{14}C-2,3,5-triiodobenzoic acid for 2-28 wk revealed three or four radioactive zones. The compounds were identified by thin-layer chromatography as unchanged TIBA, 2,5-diiodobenzoic acid, 3,5-diiodobenzoic acid, and one unknown metabolite. Thus both decarboxylation and deiodination of TIBA occurred by soil microorganisms. TIBA is metabolized more rapidly at higher soil moisture contents, and its overall degradation rate in soil can be designated as moderate.

72-2429. Haynes, R. J. (Coop. Wildl. Res. Lab., Southern Illinois Univ., Carbondale, IL). **Effects of DDT on glycogen and lipid levels in bobwhites.** *J. Wildl. Manage. 36(2): 518-523; 1972.* (19 references)

Bobwhite quails were fed DDT in the diet for 10 wk. Subsequently, one test group was maintained on regular food for several days prior to sacrifice. In the second test group, the quails were deprived of food for four days, then fed regular food for three days to restore depleted liver glycogen before sacrifice. The liver from each sacrificed bird was divided in half; one half was analyzed for glycogen via glucose assay of the liver hydrolyzate, and the other, for lipid content by Soxhlet extraction. Also, entire carcasses were ground and analyzed for lipid content. The liver glycogen levels in birds fed DDT were 27% below those of controls although this difference was not significant by the statistical comparison methods used. The livers of DDT-treated birds had significantly higher lipid contents than those not given DDT. There was no significant difference in body fat contents between the groups receiving and not receiving DDT in the diet, although the effect of food deprivation was clearly reflected in body fat content.

72-2430. Dahlgren, R. B.; Bury, R. J.; Linder, R. L.; Reidinger, Jr., R. F. (South Dakota Coop. Wildl. Res. Unit, Brookings, SD). **Residue levels and histopathology in pheasants given polychlorinated biphenyls.** *J. Wildl. Manage. 36(2): 524-533; 1972.* (13 references)

Young pheasants were given one capsule per day containing 10, 20, or 210 mg PCB (Aroclor 1254), or one capsule containing 50 or 100 mg PCB every 3.5 days. In the 210-mg group, the first pheasant died at 1.3 days, and the last at 5.9 days. Tremors began on the second day of the test; the birds became comatose shortly before death. The heaviest birds in this group lived longest and lost the greatest percentages of their weights before death. Of the birds given 50 mg every 3.5 days for five weeks, 4 of 22 died; of those given 100 mg on the same schedule, 7 of 77 died and 2 more were killed in very weak condition. In the group given 10 mg PCB per day, the first bird died at 30.6 days, and the tenth bird in the group was still alive after eight months of feeding. In the 20-mg group, the first bird died at 39.6 days, and the last, at 54.1 days. Excitation, weakness, tremors, and feather loss were noted in these groups. Brain samples from birds that died on the 210-mg/day dosage contained an average of 520 ppm PCB; pooled brain samples from dead birds in the 100-mg/3.5-day dosage group contained 320 ppm PCB; from the 50-mg/3.5 day group, 350 ppm; from the 10-mg/day group, 360 ppm; and from the 20-mg/day group, 380 ppm. Thus it appears that brain PCB levels of 300-400 ppm are indicative of PCB poisoning and cause death.

72-2431. Hill, E. F. (Tech. Dev. Labs., Dept. of Health, Educ. and Welfare, Savannah, GA). **Avoidance of lethal dietary concentrations of insecticide by house sparrows.** *J. Wildl. Manage. 36(2): 635-639; 1972.* (4 references)

The ability of the house sparrow (*Passer domesticus*) to detect and avoid the presence of lethal concentrations of Abate, bromophos, Gardona, and DDT in feed was investigated. Sparrows offered no feed at all survived only 25 to 32 hours. When only toxic feed was offered, all seven of the birds on each treatment died within three days. All birds surviving the first day on Abate and DDT died on the second day, as did 57% on bromophos and 43% on Gardona. Only trace amounts of Abate-treated feed were eaten on the first day, and

slightly more on the second day. It is not known whether death was due to intoxication or starvation. Birds given only DDT-poisoned food consumed about half of the normal amount on the first day, and were severely intoxicated by the second. Birds on bromophos and Gardona-treated feed alone showed no initial avoidance of the feed; however, feed consumption declined steadily. Birds given a choice between toxic and untreated feed always favored the untreated feed. Under choice conditions, two of the seven birds on DDT survived; all seven of the birds on Abate died; all seven of the birds on bromophos survived; and six of the seven birds on Gardona survived. Dead birds showed appreciable weight losses. Also subcutaneous and visceral fat was generally absent in DDT-fed birds, while muscle of birds in the organophosphate treatments appeared emaciated.

72-2432. Hatakeyama, H.; Shigei, T. (Second Dept. of Pathol., Yokohama City Univ., Sch. of Med., Minami-ku, Yokohama, Japan). **Fine-structural changes of alveolar walls in fibrin-induced, so-called neurogenic pulmonary edema of the rat: comparative representation with adrenaline- and ANTU-induced edema.** *Jap. J. Pharmacol. 21: 673-675; 1971.* (2 references)

Within 10 min following intracisternal (cerebellospinal cistern) injection of a fibrin solution (fibrinogen, 100 mg/ml saline; thrombin, 200 units/ml saline), four out of five test rats developed pulmonary edema, as indicated by the discharge of edematous fluid from the nostrils. Sectioned lungs from such rats displayed a moderate number of erosive foci of the type I epithelial covering. Lesions of Type II cells varied in degree and consisted of dilated granular endoplasmic reticulum, distended interspace of double nuclear membranes, and lipid granules with loss of myelinoid lamellar structure. The endothelial lining was intact. This degeneration resembles that induced by adrenalin injection, and contrasts with that induced by ANTU. In ANTU-induced edema, this type of epithelial change was not seen, but characteristically, marked edematous broadening of the alveolar interstices took place with accumulation of edematous fluid in the subepithelial space. The mechanism of ANTU edema presumably differs from that of adrenalin- and fibrin-induced types.

72-2433. Kato, T.; Yakushiji, M.; Tuda, H.; Arima, A.; Takahashi, K.; Shimomura, M.; Miyahara, M.; Adachi, M.; Tashiro, Y.; Matsumoto, M.; Funatsu, I.; Yamashita, F.; Ito, Y.; Tsugawa, S.; Funatsu, T.; Yoshikane, T.; Hayashi, M. (Dept. of Obstet. and Gynecol., Kurume Univ. Sch. of Med., Kurume, Japan). **Polychlorobiphenyls (PCB) induced fetopathy. II. Experimental studies: Possible placental transfer of polychlorobiphenyls in rats.** *Kurume Med. J. 19(1): 53-59; 1972.* (4 references)

Following the discovery that polychlorinated biphenyls (PCBs) can cause abnormalities in human neonates, studies were performed on rats to confirm the possibility of placental transfer of PCBs. Rice oil spiked with 25, 75, 225, or 675 ppm of PCBs (as KC-400) was administered by gastric tube to pregnant rats from day one of gestation. All rats in the two higher-dosage groups died around the tenth day. The rats in the two lower-dosage groups survived and delivered approximately the same number of young as controls. However, the incidence of stillbirth and postnatal death in these groups was 2-3 times as high as in controls. No developmental anomalies of surviving young were apparent. When radiolabeled PCB-containing oil was administered to rats, high PCB levels were found in maternal blood, liver, and kidney, and somewhat lower levels in maternal spleen and placenta, amniotic fluid, and in the fetus 18-48 hr after administration. Both maternal mortality rate and incidence of abortion increased in proportion to PCB dosage, suggesting that abortion was secondary to maternal poisoning rather than to fetal toxicity.

72-2434. Balogh, S.; Egeto, S.; Horvath, Z.; Papp, K.; Rozsa, J.; Szabo, J. (Szegvar, Hungary). **Akcidentalis es kiserleti Ekatin-mergezes diagnosztikai es terapiai tapasztalatai. [Diagnostic and therapeutical data on accidental and experimental Ekatin poisoning.]** *Magy. Allatorv. Lapja 27(4): 239-240; 1972.* (Hungarian)

Experimental poisoning with Ekatin (thiometon) was studied on cows, pigs, geese, and turkeys. Ekatin was administered in oral doses of 20 mg/kg to cows and pigs, and 60 mg/kg to geese and turkeys. Slight colic and dyspnea, fasciculation, then irregular trembling, bluish coloration of the visible mucous membranes, watery feces, and considerably decreased milk yield were observed in cows. Cats fed milk from such cows developed similar symptoms, but recovered quickly. The body temperature rose from 39.2 to 40.5°C by the eighth hour. Large diffuse, partly contiguous hemorrhages on the peritoneum and the heart, and red coloration of the mucous membranes of the duodenum and the jejunum were found. Slight hepatomegalia and plethoric liver were observed. Intense salivation, vomiting, trembling, spasms, horizontal nystagmus of the eyes, watery feces, and dyspnea in serious cases, were observed in pigs. Histopathological examinations revealed dark red dilated mesenteric venae, red color of mucous membranes in both stomach and small intestine, small hemorrhagic spots in the heart, and plethoric liver. The blood cholinesterase activity normalized after 114-290 minutes. Faintness, excessive salivation, watery feces, convulsions, and reddening of the intestinal mucous membranes were seen in geese and turkeys. The blood cholinesterase activity in turkeys normalized after 265-270 minutes.

72-2435. Morgan, D. P.; Roan, C. C. (Dept. of Entomol., Univ. of Arizona, Tucson, AZ 85721). **Loss of DDT from storage in human body fat.** *Nature 238(5361): 221-223; 1972.* (17 references)

Adipose storage of DDT was monitored (for three years) in three humans who ingested technical DDT. Total doses were 3.66 g, 1.83 g,and 0.26 g, at rates of 20 mg/day (183 days), 10 mg/day (183 days), and 5 mg/day (52 days). Fat biopsy samples were analyzed for the *p,p'*-DDT, and *o,p'*-DDT isomers (the technical material consisted of 77% of the first and 23% of the second). As initial storage levels declined, the percentage of DDT converted to DDE declined. DDT was lost from fat storage at maximum rates of 4.2 to 5.7 mg per day. A capacity for conversion of DDT to excretable, rather than storable, metabolites could be critical in promoting excretion, whether the chemical is ingested or is mobilized from lipid storage. In view of the high rates at which ingested DDT can be excreted, the elimination of stored DDT may be limited by the rate at which it is supplied to the gut by biliary transport.

72-2436. Tinsley, I. J. (Dept. of Agr. Chem., Oregon State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Interaction of toxicants with biological polymers.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, 35-38.* (3 references)

Organophosphate-lipid interactions were demonstrated only for dichlorvos, monocrotophos, and Shell compound 4072, using NMR spectroscopy. When lecithin was added to a solution of test compound, low field chemical shift changes were observed in the resonance peak of vinyl protons. Equilibrium constants for the interactions were calculated from these changes. Changes in the chemical shift of various lecithin proton peaks were produced by the addition of the organophosphates to a lecithin solution. Changes were observed in the area-surface pressure characteristics of lecithin monolayers in the presence of DDT, possibly indicating a DDT-lipid interaction. The results confirm the assumption that quantitative information on the interaction of chemicals with important biological systems can be obtained using NMR spectroscopy and other techniques.

72-2437. Isenberg, I.; Small E. (Dept. of Biochem. and Biophys., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Binding of dieldrin and hydrocarbons to histones and histone-DNA complexes.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, 39-44.* (6 references)

Appreciable binding of three hydrocarbons (3,4-benzpyrene, pyrene, and 9-methylanthracene) to histone IV was found to occur at pH 6.9, but not at pH 3.8. Anisotropy measurements indicated that the hydrocarbons are rigidly bound to a rather large form of histone IV involving about 200 histone molecules. Dieldrin was found to bind at both the higher pH, where the final state of histone IV exists after conformational changes, and pH 3.5, but the compound may be altered in acid. The ratio of binding of dieldrin to histone, 2.4/1, suggests that this could be a common location for *in vivo* binding of dieldrin.

72-2438. Beaudreau, G. S. (Dept. of Agr. Chem., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **The effect of environmental chemicals on tumor virus expression.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, 45-49.*

Chick embryo cells were treated with concentrations of DDT as high as 250 μg/culture with no effect on cell number or viability up to seven days in culture. Maximum uptake by a culture was about 4% at the level of 200 μg DDT/culture. From these preliminary results it appears that it will be possible to investigate the effect of DDT on the infection of fibroblasts with MC29 tumor virus, measuring virus-specific DNA polymerase activity after 42 to 72 hrs.

72-2439. Brooks, R. E. (Dept. of Pathol., Univ. of Oregon Med. Sch., Eugene, OR). **Ultrastructural histopathology of lungs of laboratory rats exposed to environmental agents.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, 83-84.*

Studies by routine histopathological and detailed electron microscopic examinations were made on rat lung tissue exposed for up to 372 days to dietary dieldrin, dietary methyl mercuric chloride, dietary lead acetate, atmospheric CO, atmospheric NO_2 and combinations of dieldrin and these agents. In rats treated with 5 ppm dieldrin, relatively normal lung tissue was found by preliminary gross and light microscopic examination. An increased incidence of lobular pneumonia, small focal pneumonic involvement, and an arteritis have been observed in some dieldrin-treated rats. No changes in morphology were noted following lead or methyl mercury administration or CO inhalation. Mucus production was more pronounced in NO_2-treated animals.

72-2440. Burt, G. S. (Dept. of Psychol., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Psychobiological aspects of environmental health.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, 85-86.*

A sophisticated, multistation behavioral interface to be used with the PDP-12 computer has been devised and is in daily use. Studies are underway to determine with greater sensitivity the threshold of effects of dieldrin on behavior. Previous studies indicated a threshold of 2.5 mg/kg for Japanese quail and rats. Electrode implantation in selected brain regions will be used to determine the effects of low levels of dieldrin on the frequency, amplitude, and wave form of spontaneous brain electrical activity.

72-2441. Gillett, J. W. (Dept. of Agr. Chem., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Pesticide-stressor interactions with microsomal enzyme systems and associated activities.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, 111-118.*

Although several problems were encountered in an investigation of factors influencing induction of rat hepatic microsomal aldrin epoxidase by dieldrin, it can be concluded that there is no interaction between methyl mercury, parathion, or CO and dieldrin and, in general, dieldrin residues are not significantly affected by these co-stressors. Induction may be impaired by NO_2 exposure, as is control activity. Lead acetate appeared to stimulate induction, though not significantly, and no inhibition of induction was noted with *Salmonella*. Miniature swine were found to have hepatic epoxidase activity of 25.7 units/mg compared to 57.9 units/mg in standard swine. Exposure to 40 ppm dieldrin increased the specific activity in miniature swine to about 1000 units/mg in 2-4 wk. Intestinal mucosa activity was markedly increased during dieldrin exposure. Lower microsomal residues were observed in the swine than in rats following similar exposure to 5 ppm ration.

72-2442. Buhler, D. R. (Dept. of Agr. Chem., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Influence of pesticides on trace metals and amino acid metabolism.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, 119-120.*

A 3- to 5-fold change in brain calcium levels was observed in rats five days after two dosings with 200 mg/kg DDT or 10 mg/kg hexachlorophene. None of the other trace metals examined was affected by the compounds. Neither pesticide significantly altered levels of the metalloenzymes tested, including alcohol dehydrogenase from liver and kidney, and alkaline phosphatase from liver, kidney, and plasma.

72-2443. Morris, R. O. (Dept. of Agr. Chem., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Effects of pesticides on the endoplasmic reticulum-ribosome systems of rat liver.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, 121-125.* (4 references)

In preparation for an investigation of the effects of DDT ingestion on rat liver cells, particularly the endoplasmic reticulum-ribosome system, a rapid, reliable technique was developed for the isolation of smooth and rough endoplasmic reticulum. Postmitochondrial supernatants from rat liver homogenates were centrifuged at 204,000 X g for 3 hrs on 3-step discontinuous sucrose density gradients. Rats fed normal and DDT-supplemented diets showed no change in appetite or growth rate, but had increased liver to body weight ratios during the first week. A 2 ppm DDT diet resulted in as much proliferation of smooth endoplasmic reticulum as the 10, 50, and 150 ppm diets; the experiment is being repeated because of high control levels. *In vitro* experiments with membranes from DDT-treated rats are underway.

72-2444. Montgomery, M. (Dept. of Agr. Chem., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Environmental chemodynamics – comparative metabolism of chemical toxicants.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, 126-127.*

Nearly 80% of ^{14}C-labeled 2,4-D administered orally to rats was excreted in 24 hr, and analysis of urine and feces by GLC and TLC indicated no detectable metabolites. Hydroxylated plant metabolites of 2,4-D were excreted more slowly, 65 to 70% being found in the first 24-hr samples. Conjugated metabolites were absorbed and apparently hydrolyzed to one or more products. The chemistry of these metabolites is being investigated.

72-2445. Haque, R. (Dept. of Agr. Chem., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Environmental chemodynamics – binding of selected pesticides to protein and lipids.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, 128-132.*

Equilibrium dialysis experiments indicated that 2,4-D binds strongly to hemoglobin and bovine serum albumin. In nuclear magnetic resonance (NMR) studies of the trimethyl sulfonium salt of 2,4-D, an interaction was noted between the 2,4-D anion and the proteins. Equilibrium constants were calculated to be $8.4 \times 10^{-3} M$ and $0.288 M$ for the 2,4-D-albumin and 2,4-D hemoglobin complexes, respectively; the pH optimum for complex formation was 6.8. Results of an NMR study of the binding of DDT, TDE, DDE, DDA, methoxychlor, and kelthane to a lipid lecithin suggest that ability to bind to lecithin, or related lipid, through the benzylic proton is a factor in the insecticidal activity of these compounds. Equilibrium constants were calculated for various protons studied. Work on the chemodynamics of Aroclor 1254 and DDT is in progress. Preliminary measurements show that Aroclor 1254 has a water solubility of 40 to 50 ppm and that vapor loss is negligible at 25° but appreciable at 60°C. DDT loss from soil after 10 days was found to be negligible.

72-2446. Tinsley, I. J. (Dept. of Agr. Chem., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Interaction of nutritional and toxic stress with emphasis on lipid metabolism.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, 138-143.*

Experiments with CPIB (ethyl *p*-chlorophenoxyisobutyrate, clofibrate), which is very similar to the phenoxyacetic acid herbicides, indicate that the com-

pound influences the metabolism of fatty acids. For a study of the composition, structure, and function of the membranes in the normal and induced system, satisfactory methods of preparing smooth (SER) and rough (RER) endoplasmic reticulum have been developed, along with a procedure for the stripping of ribosomes from the RER. Spectra of the SER and stripped RER are identical and similar to those of other biological membranes. About 30 to 50% helical structure is suggested. Using pronase, a non-specific proteolytic enzyme, 65% of the SER protein was hydrolyzed. In preparation for studies on the dietary effects of mercury, accumulation of dietary organic and inorganic mercury is being measured. The effect of DDT on the production of fatty livers by a choline deficiency is being investigated.

72-2447. Arscott, G. H. (Dept. of Poultry Sci., Oreg. State Univ., Environ. Health Sci. Sent., Corvallis, OR 97331). **Interaction of a nutritional and toxic stress with emphasis on lipid metabolism (avian studies).** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, 144-160.*

DDT at 100 ppm in the diet did not appear to adversely affect reproduction of chickens in a 24 wk study, although the birds failed to gain weight and one mortality occurred. Dietary intake of DDE, during or prior to eight 28-day production periods in Japanese quail, did not significantly affect egg production, feed consumption, egg weights, and female body weights at two calcium levels. Current DDE treatment did not affect eggshell thickness. Weight loss in males occurred at DDE intake of 100 and 300 ppm with lower calcium levels, and in females at 300 ppm. Egg production was adversely affected at 300 ppm DDE. The LD50s for young Japanese quail fed DDE and DDT were 450-500 ppm and 350-400 ppm, respectively, for a 2-wk period. In other studies with Japanese quail, no interactions were found in a study of dieldrin intake and variable vitamin A intake, and no differences were found between DDT stress and massive doses of ascorbic acid.

72-2448. Stephen, W. P. (Dept. of Entomol., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **The effects of chronic sublethal doses of pesticides on behavior and longevity in arthropods.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, 161-167.* (3 references)

In the leafcutter bee, the rhythmic response to sublethal doses of parathion appeared to be light-cued, while the response to dieldrin was temperature-dependent. With continuous light the mortality with parathion was bimodal with peaks at 6 and 15 hr after a rise in temperature. Dieldrin peak mortality occurred independent of the light cycle at 8 hr after a temperature rise. Resistance to parathion observed during the active period may have been due to high ChE levels predicted to occur at this time. In a study of the effect of dieldrin, parathion, and carbaryl on the ability of the leafcutter bee to synchronize its activity rhythm to the environment, there was no evidence of the clock being affected. Of the 24 bees studied, five showed a marked reduction of locomotor activity for up to 48 hr. Web spinning behavior in the female spider was not affected by single applications of carbaryl and parathion, but the amount of silk available was reduced. Dieldrin exposure produced a decrease in the ability of the spider to measure the central angle as it spins its web, indicating a possible effect on the brain.

72-2449. Fink, G. B. (Dept. of Pharmacol., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Pharmacological effects of pesticides.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, 168-172.*

Lead, DDT, lindane, and dieldrin did not markedly affect audio-conditioned convulsive responses in young mice. In general, they increased the susceptibility of mice to clonic seizures produced by iv infusion of pentylenetetrazol and electrical stimulation. Little significant interaction was noted. Dieldrin and DDT had characteristic effects on maximal electroshock seizures, but none of the agents had an effect on strychnine-induced seizures. Dieldrin exhibited a dose-related impairment of the ability of mice to stay on a rotating rod, and both DDT and dieldrin decreased swimming time. Combination of lead with DDT or dieldrin resulted in more marked effects in both tests. Endrin, but not dieldrin, produced hypertension followed by terminal hypotension in dogs. DDT potentiated the hepatotoxicity of CCL_4 in rats and attempts were made to elucidate the mechanism of this phenomenon.

72-2450. Burt, G. S. (Dept. of Psychol., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Psychobiological effects of pesticides.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, 173-174.*

A 32-station operant conditioning interface for behavioral research and a system of remote CRT monitors to be used in investigations of neurophysiological effects of pollutants have been developed. The chambers of the interface are controlled by a PDP-12 computer via a MODEM data transmission system. A number of programs for control of reinforcement contingencies have been developed and include operant schedules shown to be sensitive measures of the effects of low levels of dieldrin. Circuitry has been developed for display of analyzed data from the neurophysiological research on a CRT for photography, and on a monitor screen for on-line display. Analysis of results of a computer-controlled study of the effects of acute dieldrin administration on fixed interval performance of rats will soon be completed.

72-2451. Harr, J. R. (Dept. of Vet. Med., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Effect of multiple toxic environmental agents at the cellular to individual levels of biological organization.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, 175-180.*

Initial results of a study of dieldrin residues in cerebrums of male rats show a pattern, previously observed with other tissue, of a plateauing or decreasing residue concentration from 40-100 days after exposure and followed by a steady increase. Exposure to CO, methyl mercury chloride, or parathion did not alter the pattern. Possible interactions between dieldrin and the co-toxicants include alterations in dieldrin metabolites, in parathion excretion, in liver microsomal activity and in dieldrin residue levels. Miniature swine were found to be useful animals for the study of dieldrin residues since they are easy to handle surgically, can be repeatedly biopsied, and have dietary requirements, physiology, and mass more closely related to humans than those of the rat. Initial experiments with miniature swine revealed hepatic changes including enlarged cells, obliteration of Desie spaces, constriction of the sinusoids, more eosinophilic cytoplasm and the presence of small, clear vacuoles in 3/7 of the dieldrin-fed pigs.

72-2452. Warren, C. E. (Dept. of Fish. and Wildl., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Effects of dieldrin on the longevity, reproduction and growth of aquatic animals in laboratory ecosystems.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, 181-185.* (1 reference)

The influence of dieldrin at 0.1 the 96-hr LC50 on a model exploited fish population, with a fixed food supply was studied. Preliminary analysis of results revealed no change in the mean biomass of the populations. Growth was not affected in populations exploited at 0.15%, 0.30%, and 0.45%. Larger numbers of fish in the population exploited at 0.60% may have been responsible for the reduction in growth observed, since the limiting factor was food. Production rate and yield were apparently not affected by dieldrin at any exploitation rate.

72-2453. Claeys, R. R. (Dept. of Agr. Chem., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Analytical support and method development.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, 200-211.* (21 references)

As part of the analytical support for co-stressor experiments, an attempt was made to monitor dermal exposure to parathion in rats by measuring PNP (*p*-nitrophenol) in the urine. Since background interference was present, a dose-excretion relationship was not obtained. Work on the metabolism of dieldrin in rats, using a gas chromatograph equipped with a microcoulometric detector, revealed an unknown compound, previously unreported; a product which is probably hydroxylated dieldrin; and one which is probably the ketone-methylene bridge metabolite. Exposure to methyl mercury chloride, CO, or parathion altered the excretion of metabolites, but dieldrin residues remained the same. Time saving steps established for the determination of pesticides included elimination of extensive glassware washing by drying in a 300° oven and substitution of a trimethylpentane addition for the hexane-aqueous acetone partition.

72-2454. Davis, G. E.; Negilski, D. S. (Dept. of Fish. and Wildl., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Independent and joint toxicity of cyanide, pentachlorophenol and zinc in model stream communities.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, 218-219.*

The effects of cyanide, pentachlorophenol (PCP), and zinc were investigated on juvenile chinook salmon and stream invertebrates. Preliminary results indicate that salmon production is not significantly affected in streams containing the toxicants alone at 0.1 the 96-hr LC50 or in combination, each at 1/30 LC50. In the stream containing each toxicant at 0.1 LC50, salmon production differed markedly from that in the control stream. Total biomasses of invertebrates do not appear to be markedly affected by the kinds and concentrations of toxicants. The problem of establishing safe levels for pollutants would be simplified if individual compounds having different modes of action were shown to have a generally additive effect.

72-2455. Harr, J. R. (Dept. of Vet. Med., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Effect of chronic dietary exposure to MSMA in rabbits.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, 230.*

Investigations are being made on the histological and residual effects of dietary exposure in rabbits to MSMA, at a level observed in the Okanoggen Forest as a result of tree-thinning operations. Tissue analyses and histological observations are not complete, but there is evidence of intestinal congestion and inflammation in shorter term exposure groups. Possible liver abnormalities are also indicated.

72-2456. Harr, J. R. (Dept. of Vet. Med., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **A therapeutic regimen for purging dieldrin from adulterated cattle.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972. 232.*

A therapeutic regimen was established for beef cattle exposed to dieldrin via the food supply. The metabolism of dieldrin in tissue was increased and reabsorption through the bile into the digestive tract prevented. The rate of reduction of dieldrin in 30 days was

81% using the regimen compared to 30% before treatment. The half-life of dieldrin in body fat was reduced from 133-227 days to 33-57 days.

72-2457. Creger, C. R.; Kubena, L. F. (Dept. of Poultry Sci., Texas A & M Univ., College Station, TX 77843). **The effect of lipotropic agents on depletion of chlorinated hydrocarbons from tissues of birds.** *Poultry Sci. 50(5): 1567-1568; 1971.*

Two trials were conducted utilizing a total of 160 one-week-old unsexed Japanese quail (*Coturnix c. japonica*) to determine the effect of choline chloride and inositol supplementation on the depletion rate of heptachlor. Supplementation of the diet with a combination of choline chloride and inositol was effective in reducing the heptachlor residue in the tissue samples studied. The metabolism of heptachlor appears to occur in the liver with subsequent elimination of the residue and not deposition in body tissue. The addition of 10% vegetable oil to the basal diet caused a significant increase in the heptachlor residue in the tissue samples analyzed. Dietary supplementation of lipotropic agents, choline chloride and inositol, in laying quail diets resulted in a significant decrease in the total carcass residue of DDT and metabolites; and the residue of DDT and metabolites observed in the egg yolk was a direct reflection of the DDT present in the carcass. Choline chloride and inositol supplementation at levels of 2.65 or 1.32 and 2.0 or 1.0 g per kg. of diet, respectively, caused a more rapid depletion of DDT and metabolites; but, this increased elimination rate was not due to elimination in the egg yolk. (Author abstract by permission)

72-2458. Lillie, R. J.; Denton, C. A.; Cecil, H. C.; Bo.. man, J.; Fries, G. F. (Anim. Sci. Res. Div., Agr. Res. Serv., U.S. Dept. of Agr., Beltsville, MD 20705). **Effect of *p,p'*-DDT, *o,p'*-DDT and *p,p'*-DDE on the reproductive performance of caged white leghorns.** *Poultry Sci. 50(5): 1597-1598; 1971.*

Nine groups of 20 caged White Leghorn pullets each were fed a standard breeder diet supplemented with 5, 25, or 50 ppm *p,p'*-DDT, *o,p'*-DDT or *p,p'*-DDE in Experiment 1 (28 weeks); the 5 and 25 ppm levels were increased to 150 and 300 ppm, respectively, in Experiment 2 (additional 12 weeks). A tenth group fed no pesticides served as the control in both experiments. Least squares analysis of variance indicated in Experiment 1 pesticide effects for body weight gains which showed a rank of decreasing order: *p,p'*-DDT > *o,p'*-DDT > *p,p'*-DDE. The three pesticides produced significantly heavier body weights than the control. The level X pesticide effects indicated that the 5 and 25 ppm levels of *p,p'*-DDE increased body weight gains more than the 50 ppm level and that the 5 and 50 ppm levels of *p,p'*-DDT and *o,p'*-DDT, respectively, significantly reduced hatchability as compared with the other two levels within the pesticide. In experiment 2, pesticide effects showed that the three pesticides significantly reduced egg production; no differences were noted between the pesticides for this trait. No significant differences due to pesticides, as compared with the control, were observed for mortality, fertility, hatchability, and progeny growth in both experiments. (Author abstract by permission)

72-2459. Muller, H. D. (Dept. of Avian Sci., Colorado State Univ., Fort Collins, CO 80521). **Reproductive responses of the mallard duck to subtoxic pesticide ingestion.** *Poultry Sci. 50(5): 1610; 1971.*

Mature Mallard ducks were fed subtoxic levels of dieldrin or parathion for periods of 90 days, which were initiated approximately 30 days prior to the onset of egg production. Five trios each received either 10 ppm of parathion or 4 ppm of dieldrin; six trios received the basal diet and constituted the control. Measurements of egg production, fertility, hatchability levels, and egg shell thickness were maintained. Hatching and subsequent body weights of progeny were monitored to six weeks of age. No differences in egg production or fertility were noted during the duration of the investigation. Hatchability of fertile eggs from dieldrin treated parent stock was significantly ($P = .05$) reduced to less than half of control or parathion performance. Egg shell thickness measurements demonstrated that parathion presented significantly ($P = .05$) thinner egg shells than controls, but did not differ from dieldrin shells, .284, .308, and .295 mm., respectively. Reduced hatchability of fertile eggs from dieldrin treated ducks must be ascribed to factors influencing embryo survival more directly than shell thickness *per se*. Equivalent hatching weights and body weights to six weeks of age were determined for progeny of treated and control groups. (Author abstract by permission)

72-2460. Muller, H. D. (Dept. of Avian Sci., Colorado State Univ., Fort Collins, CO 80521). **Responses of three generations of gray partridge to low level of pesticide ingestion.** *Poultry Sci. 50(5): 1610-1611; 1971.*

Three overlapping generations of Gray partridge were fed subtoxic levels, 2.5 ppm of dieldrin or 8 ppm of parathion, for periods of 90 days per year. The feeding periods were initiated approximately 30 days prior to first egg in all years. Aberrations in egg production, fertility, hatchability, and egg shell thickness were significantly manifested during the second year of treatment. During a third year in which no treatments were applied, recovery of egg production and fertility was evident for former dieldrin treated individuals. Parathion, however, continued to exert debilitating effects. When subjected to treatment, F-1 progeny of treated individuals responded with fertility and hatchability levels significantly in excess of control values. F-2 parathion fed progeny produced eggs with shells significantly thicker than control or dieldrin treated F-2's. Significant body

weight differences were demonstrated by second year progeny of both P-1 and F-1 breeders as well as by first year progeny of F-2 individuals. In all three instances, chicks from parents on parathion treatment were significantly heavier than control chicks. In the former two cases, dieldrin chicks exceeded controls; in the latter, they did not. (Author abstract by permission)

72-2461. Muller, H. D.; Lockman, D. C. (Dept. of Avian Sci., Colorado State Univ., Fort Collins, CO 80521). **The influence of dieldrin on bone calcium deposition in domestic chicks.** *Poultry Sci. 50(5): 1611; 1971.*

DDT and other chlorinated hydrocarbons have been demonstrated to cause egg shell thinning in avian species. Egg shell thinning responses to insecticide ingestion have been implicated as the causative mechanism for reproductive failures among several avian species. The mode of action of chlorinated hydrocarbons on mineral metabolism is not clearly understood. Egg shell thinning indicates that calcium metabolism is altered in some manner. This study was designed to determine if subtoxic dieldrin ingestion would influence skeletal calcium deposition in rapidly growing young birds. Groups of 150 Single Comb White Leghorn and broiler type chicks were randomly distributed among four treatments and a control. Dieldrin was administered at either 5 or 10 mg/kg body weight levels, in single capsules, at one week of age or continuously in the diet at 5 or 10 mg/kg feed levels from one through five weeks of age. The study was replicated with birds from the same source. At 35 days of age, left tibias were removed, dried, fat extracted, and dry ashed for percent moisture, fat, and ash determinations. Calcium contents were determined using atomic absorption spectrophotometry techniques. No significant differences in percent tibial bone calcium were found at the $P = .05$ level in either Leghorn or broiler groups. Dieldrin apparently did not adversely influence skeletal calcium deposition in young, rapidly growing birds. Apparently, calcium metabolism as involved in skeletal development is independent of the mechanism responsible for subsequent egg shell formation. (Author abstract by permission)

72-2462. Robson, W. A.; Arscott, G. H.; Tinsley, I. J. (Dept. of Poultry Sci., Oregon State Univ., Corvallis, OR 97331). **The effect of DDE on the performance of *Coturnix coturnix* japonica.** *Poultry Sci. 50(5): 1623-1624; 1971.*

Four hundred day-old Japanese quail of mixed sex were fed 0 to 50 ppm of DDE (2,2-*d*-bis-(*p*-chlorophenyl)-1,1-dichloroethylene) on a soybean meal-glucose monohydrate diet to two weeks of age. Thereafter the dosage was increased to 100 ppm on a corn-soybean meal diet. At the beginning of 25% egg production (*ca* 10 wk) the two populations were subdivided so that the pesticide treatments were reversed for ½ of each population. The resulting four populations were further subdivided to receive diets containing 0.5 or 3.0% calcium. The males were separated from the females and fed the lower calcium level. The results through eight 28-day production periods did not appear affected by DDE intake during the developing period. Egg shell thickness, as measured by specific gravity, and number of cracked eggs were not affected by current DDE treatment. Egg shells from quail fed the lower calcium level were markedly thinner and contained more cracks. Egg production, feed consumption, egg weights, and female body weights were not significantly affected by DDE. Female mortality, associated with prolapse, was higher with 3% calcium and only toward the end of the trial did it appear related to DDE intake. Male mortality was significantly higher with DDE and was accompanied by a gradual loss of body weight from the 3rd through 8th periods. (Author abstract by permission)

72-2463. Cohen, S. D.; Murphy, S. D. (Kresge Cent. for Environ. Health Dept. of Physiol., Harvard Sch. of Pub. Health, Boston, MA 02115). **Inactivation of malaoxon by mouse liver.** *Proc. Soc. Exp. Biol. Med. 139(4): 1385-1389; 1972.* (20 references)

An investigation is described to determine if a binding mechanism is involved in the detoxification of malaoxon in mouse liver and in the potentiation of malaoxon anticholinesterase activity by other organophosphates. A comparison of the manometric and anti-ChE methods indicated that only 50% of the detoxification occurring during a 25-min incubation at 38°C was due to carboxylesterase hydrolysis of malaoxon. The lack of a detectable effect of incubation temperature on the amount of malaoxon inactivated per min suggests a noncatalytic binding mechanism. Malaoxon binding was inhibited by malathion-potentiating doses of other organophosphates, which also inhibited carboxylesterase activity *in vivo*. The close correlation observed between carboxylesterase inhibition and malaoxon binding inhibition, suggests that carboxylesterases may act as noncritical binding sites for malaoxon inactivation. Both malaoxon binding and catalytic hydrolysis may contribute to malaoxon detoxification; inhibition of binding may contribute to malaoxon potentiation by compounds competing for binding sites.

72-2464. Ferry, D. G.; Owen, D.; McQueen, E. G. (Toxicol. Res. Unit, Med. Res. Counc. of New Zealand). **The effect of phenytoin on the binding of pesticides to serum proteins.** *Proc. Univ. Otago Med. Sch. 50(1): 8-9; 1972.* (5 references)

Serum levels of total lindane and total dieldrin decreased while levels of total DDT temporarily increased following iv injection of phenytoin (1.5 g) in sheep pretreated with lindane (27.5 mg/kg), dieldrin (30 mg/kg), or DDT (50 mg/kg). Free lindane levels, measured after ultrafiltration, increased slightly. Changes in free dieldrin and DDT levels could not be detected

because of the extremely low levels. Phenytoin may displace lindane and dieldrin from protein, contributing to the reduction of the body level of these two pesticides. However, since DDT did not appear to be displaced, the reduction of DDT levels observed in humans, following long-term treatment with phenytoin, must not be related to displacement from protein.

72-2465. Ferry, D. G.; Owen, D.; Ballard, D. L.; McQueen, E. G. (Toxicol. Res. Unit, Med. Res. Counc. of New Zealand). **Pesticides and serum proteins.** *Proc. Univ. Otago Med. Sch. 50(1): 10-11; 1972.* (4 references)

Dieldrin, DDT, and lindane were found to be almost totally bound to serum proteins in sheep. Total ng/ml of DDT, dieldrin, and lindane was 780-960, 770-870, and 850-1040, respectively, and percentage free was <0.03, 0.08-0.11, and 1.29-1.49. The distributions of the three pesticides among the three protein components separated on Sephadex G200 were different. DDT eluted mainly with the first peak, dieldrin eluted mainly with the second and third, and lindane was found almost entirely in the third fraction. In human and rat serum very little DDT was found in the second fraction, compared to that in the sheep.

72-2466. Maebashi, H.; Nishimura, M.; Ueda, K.; Ogata, S.; Kawamura, A. (Sch. of Hyg., Tokyo Dental Coll., Tokyo, Japan). **[Experimental chronic intoxication caused by organophosphorus insecticides on beagles.]** *Sangyo Igaku (Jap. J. Ind. Health) 14(4): 411; 1972.* (Japanese)

Since an abnormal eye syndrome appeared to be linked to organophosphorus and carbamate pesticides, experiments were conducted with Baycid (fenthion) and fenitrothion. Corneal abnormalities occurred with rats. The same tests were attempted with beagles. Each was given a daily dose of capsuled Baycid or fenitrothion 2 mg/kg for a year. The results included reduced rates of serum ChE activity and erythrocyte ChE activity although both fluctuated considerably. General health remained unchanged. No abnormalities were found in blood, urine, or ophthalmological examinations. After the sacrifice of the dogs, the ChE activities were determined in liver and brain. The results were: 0.79-1.10 ΔpH/hr in the control, 0.53-0.36 with fenitrothion, 0.41-0.36 with Baycid for the former area; 0.45-0.54, 0.36-0.33, 0.26-0.27, respectively, in the latter area.

72-2467. Zhorzholiani, V. S. (Inst. of Occup. Health and Dis. of the GSSR Min. of Pub. Health, Tiflis, USSR). **Vliyaniye dlitel'nogo vvedeniya kaptana na funktsiyu gonad. [Effect of prolonged injection of captan on the function of gonads.]** *Soobshch. Akad. Nauk Gruz. SSR 64(3): 749-751; 1971.* (Russian)

The effects of different doses of captan on the gonads of white rats and mice were studied in chronic poisoning tests over 12 months. Preliminary tests on the general effect of captan revealed a liminal dose of 11.5 mg/kg in rat. The effects of 20, 10, 5, and 2.5 mg/kg doses of captan on rat gonads were investigated. Disturbed estrous cycle with increased cycle duration (12 days), and reduction in the number of both implanted and normally developed embryos due to 20, 10, and 5 mg/kg doses were observed, while only 2.5 mg/kg doses were ineffective. Reduced motility and respiration of the spermatozoa, and decreased fertility in females due to 20 and 10 mg/kg doses were determined. The liminal doses of captan, determined with regard to gonadotoxic effects, were 5 mg/kg in females and 10 mg/kg in males. Captan in 4 and 2.6 mg/kg doses reduced the number of implanted and normally developed embryos in mice, and doses of 1 mg/kg had only slight effect on the embryogenesis. The liminal dose in males, determined from gonadotoxic effects, was 4 mg/kg. The results indicate the particularly high sensitivity of the gonads for captan, which has gonadotrophic properties.

72-2468. Zhorzholiani, V. S. (Inst. for Occup. Health and Dis. of the GSSR Min. of Pub. Health, Tiflis, USSR). **Materialy o kumulyatsii kaptana u laboratornykh zhivotnykh. [Materials on the cumulation of captan in experimental animals.]** *Soobshch. Akad. Nauk Gruz. SSR 65(1): 225-227; 1972.* (Russian)

The cumulative effects of different doses of captan in white rats and mice were studied over 60 days. The respective mortalities in rat groups poisoned with 530, 265, and 132 mg/kg/doses were 50, 40, and 5%, while 53 mg/kg-doses proved to be ineffective. The mean lethal dose was found to be 18,993 ± 2,698 mg/kg, and a cumulation coefficient of 7.1 was determined. Hypochromic anemia, leukopenia, increased erythrocyte sedimentation, both reduced blood sugar level and cholinesterase activity, and increased blood cholesterin level were observed in the groups treated with 265 and 132 mg/kg doses. Both reduced motility and respiration of spermatozoa, and extension of the estrous cycle were determined in the same groups. The mortality of mice treated with 27 and 13.8 mg/kg-doses were 60% and 40%, respectively, while 6.9 and 2.5 mg/kg doses were ineffective. Hypochromic anemia, leukopenia, intensified erythrocyte sedimentation reaction, and increase in the count of erythrocytes containing fetal hemoglobin in the 27 mg/kg group were observed. Gonadotoxic effects were determined in the latter and the 13,8 mg/kg group. The cumulation coefficient of captan for mice was 4.8. The results indicate slight cumulative effect, and the lack of specific gonadotoxic effects of captan.

72-2469. Welsh, M. J.; Hanselka, C. W. (Dept. of Biol., Texas A & M Univ., College Station, TX 77843). **Toxicity and sublethal effects of methyl parathion on be-**

havior of Siamese fighting fish (*Betta splendens*). *Tex. J. Sci. 23(4): 519-529; 1972.* (20 references)

Toxicity levels and sublethal effects of methyl parathion (MP) on response and display times in Siamese fighting fish are described. The first phase of the study was devoted to the determination of LC50. Two fish were placed in each of a series of jars containing 4.0-8.0 ppm of MP; two controls were placed in water containing only the solvent (hexane). Response times and elapsed times to aggressive display between male B. *splendens* were investigated. The LC50 level was 7.5-8.0 ppm; no mortality occurred up to 6 ppm. Loss of appetite and weight were observed in the surviving fish. The elapsed times for response and display of fish treated with MP increased with concentration. Prior to the treatment, 90% of the fish responded to the other male; at 1 ppm the response percentage dropped to 40%, and to 4% with 3 ppm. Untreated fish displayed 84% of the time, which dropped to 0% at the 3 ppm concentration. The display ritual in the untreated fish with a treated fish was also abnormal; this behavior is discussed.

72-2470. Bricaire, H.; Luton, J.-P.; Mathieu de Fossey, B.; Remy, J.-M. (Cen. de Recherches Endocrinol., Clin. Med., Centre Hospitalo-Universitaire Cochin, 75-Paris-14, France). **La place des anticortisoliques de synthese dans les syndromes de Cushing. [The role of synthetic cortisol synthesis inhibitors in Cushing's syndromes.]** *Sem. Ther. 47(1): 7-10; 1971.* (French)

Although adrenalectomy is still the only effective therapy for Cushing's syndromes, synthetic adrenal hormone synthesis inhibitors such as *o,p'*-DDD (TDE) and aminoglutethimide are being used as supportive treatment. *o,p'*-DDD causes decreased cortisol secretion (at the adrenal level) and produces alterations in peripheral cortisol metabolism, leading to lowered urinary 17-OH corticosteroid levels without affecting plasma cortisol content. The block in cortisol synthesis is assumed to occur between the 5-hydroxypregnenolone and the 17-hydroxyprogesterone stages. No evidence as to the exact mechanism of action is available as yet. Clinical improvement (hypercorticism abatement) occurs after one or two months of administration of *o,p'*-DDD. However, therapeutic use of this substance is promising only in cases of adrenal hyperplasia or of preparatory treatment required to eliminate surgical hazards associated with hypercorticism. The compound provides no means of preventing the proliferative processes in adrenal cancer.

72-2471. Buchel, I.; Levy, J. (Inst. de Pharmacol., Fac. de Med., 75-Paris, France). **Induction des hydroxylases des microsomes du foie. II. Reversibilite, reproductibilite de l'induction chez le rat, pretraite par le phenobarbital. [Induction of hydroxylases of liver microsomes. II. Reversibility, reproducibility of induction in rats pretreated with phenobarbital.]** *Therapie 25: 107-123; 1970.* (12 references) (French)

Groups of immature and mature male and female Wistar and Sprague-Dawley rats were pretreated with phenobarbital (i.p., 50-80 mg/kg/d for 2 consecutive days), chlordane (i.p., 25 mg/kg/d for 3 days) or SKF 525 A (diphenyl 4-4 pentanoate β-diethylaminoethane) (i.p. 1 X 50 mg/kg or 5 mg/kg) and injected after different time intervals with sodium pentobarbital (25 or 30 mg/kg, i.p. or i.v.). Duration of sleep and level of catabolism of pentobarbital in blood and brain were measured at various times after injection and upon awakening. Pretreatment did not change the reactivity of rats to pentobarbital, but caused an acceleration of catabolism. A correlation between shortening of sleeping time and catabolism was demonstrated. Duration of sleep was longer after i.v. than after i.p. administration. On awakening, the average levels of the drug in brain did not differ from controls regardless of type of inducing agent, sex of animal, dose, or mode of administration. A more rapid catabolism of pentobarbital was noted in Sprague-Dawley rats (as compared to Wistar) and in younger (6-11 weeks) animals as compared to older (15-21 weeks) ones. The enzymatic induction by phenobarbital was completely reversible and reproducible at least four times if pretreatment was spaced 11 days apart. Induction was less reversible in animals pretreated with chlordane than with phenobarbital.

72-2472. Mogilevchik, Z. K.; Rusyaev, A. P.; Vyalchannikov, K. A.; Buslovich, S. Y. (Byelorussian Sci. Res. Sanit. Hyg. Inst. and the Minsk State Med. Inst., USSR). **Znacheniye nespetsificheskikh proyavleniy intoksikatsii pestitsidami v normirovanii ikh ostatochnykh kolichestv'. [Importance of nonspecific manifestations of pesticide poisoning in setting norms for their residual quantities.]** *Vop. Gig. Toksikol. Pestits. Tr. Nauch. Sess. Akad. Med. Nauk SSSR 1967: 49-51; 1970.* (Russian)

Criteria for minimal toxic effects were established for carbamate insecticides (carbaryl) and for 2,4-D derivatives using albino rats and mice as experimental animals. A drop in cholinesterase activity in the blood and viscera, an increased blood serotonin, and an increased number and saturation of the enterochromaffin Kulchitsky cells in the duodenum indicate toxic effects. Activation of the hypophyseal-adrenal system is also observed, manifested by an increase in weight of the adrenal glands and a decrease in their ascorbic acid content, eosinopenia,and involution of the thymo-lymphatic system. Organophosphorus insecticides, administered at 1/10 LD50 (acute tests) or 1/20 LD50 (chronic tests) produced changes in cholinesterase activity, serotonin, and Kulchitsky cells in the first case, but only in the serotonin in the second case. The administration of a single dose of carbaryl into the rat stomach only decreases cholinesterase activity at a dosage of 60 mg/kg body weight, whereas at a 10 mg/kg dose serotonin is increased by 21%. Toxicity of the 2,4-D derived herbicides may be demonstrated by a drop in the basal metab-

olism of mice after a single administration into the stomach. The most sensitive tests for long-term administration are the changes in aldolase and phosphohexose isomerase activities. These tests, in rats, are sensitive in doses 20-30 times lower than maximum tolerance tests.

72-2473. Eastin, E. F. (Dept. of Soil and Crop Sci., Texas A & M Univ., College Station, TX 77843). **Degradation of fluorodifen-1-^{14}C by peanut seedling roots.** *Weed Res. 11(2-3): 120-123; 1971.* (7 references)

Degradation of *p*-nitrophenyl-*α,α,α*-trifluoro-2-nitro-*p*-tolyl ether (fluorodifen) labelled with ^{14}C in the 1 position of the *p*-nitrophenyl ring (1′-^{14}C) proceeded rapidly in peanut (*Arachis hypogae* L. cv. Starr) seedling roots. All degradation products were present after only 2 hr. The major degradation products for fluorodifen-1′-^{14}C were the water-soluble compounds *p*-nitrophenol and Unknown I, a polar compound or complex which remained on the origin during thin-layer chromatography. Minor products included *p*-nitrophenyl-*α,α,α*-trifluoro-2-amino-*p*-tolyl ether, *p*-aminophenyl-*α,α,α*-trifluoro-2-nitro-*p*-tolyl ether, and traces of *p*-aminophenol. No *p*-aminophenyl-*α,α,α*-trifluoro-2-amino-*p*-tolyl ether was detected. The *p*-aminophenol previously reported [*Pl. Physiol., Lancaster,* 44, 1397–1401 (1969)] was not *p*-aminophenol, but primarily Unknown I with a possible trace of *p*-aminophenol. Fluorodifen continued to be absorbed throughout the 72 hr treatment period. (Author abstract by permission)

72-2474. Maroder, H. L.; Prego, I. A. (Unidad Fisiologia Vegetal, Cent. de Investigationes en Ciencias Agronomicas, CICA, INTA, Castelar, Buenos Aires, Argentina). **Transformation of picloram in *Prosopis ruscifolia* and *Diplotaxis tenuifolia*.** *Weed Res. 11(2-3): 193-195; 1971.* (11 references)

A radiolabeled picloram solution was dispersed onto the upper surface of newly expanded leaves of vinal (*P. ruscifolia*) or fully developed leaves of *D. tenuifolia*. Forty-eight hours later, leaves were removed, washed, and blender-extracted with ethanol. The homogenate was centrifuged, and the residue again extracted with ethanol; this process afforded 95% recovery of total radioactivity. The concentrated supernatants were examined by thin-layer radiochromatography, which revealed several other radioactive substances in addition to picloram (*Rf* 0.57). One derivative with *Rf* 0.35 was present in appreciable quantities. This substance was rechromatographed after acid hydrolysis, and the resulting hydrolysis product gave *Rf* values similar to those of picloram in two solvent systems. Therefore, the derivative is probably a picloram conjugated compound.

72-2475. Fiveland, T. J.; Erickson, L. C.; Seely, C. I. (Dept. of Plant Sci., Univ. of Idaho, Moscow, ID 83843). **Translocation of ^{14}C-assimilates and 3-amino-1,2,4-triazole and its metabolites in *Agropyron repens*.** *Weed Res. 12(2): 155-163; 1972.* (20 references)

Translocation of 3-amino-1,2,4-triazole-5-^{14}C (^{14}C-amitrole) was compared to that of ^{14}C-assimilates in couch grass (*Agropyron repens* (L.) Beauv.) at three different growth stages. Assimilates of $^{14}CO_2$ were translocated from the treated shoot to other shoots and rhizomes at the 2-3-leaf and 3-4-leaf stages of development. Much less labeled material was translocated into untreated shoots at the 5-leaf stage. More ^{14}C-assimilates were translocated to the roots than to untreated shoots at all developmental stages. The translocation patterns of ^{14}C-amitrole and ^{14}C-assimilates were similar. Two metabolites, A and B, were formed from ^{14}C-amitrole, which chromatographed identically to previously described metabolites in *Cirsium arvense* (L.) Scop. A was further metabolized into B. Labeled amitrole and its two metabolites were translocated throughout the plants. Metabolite A was phytotoxic when concentrated and re-applied to couch grass, but its properties were not those of Unknown II from *Cirsium arvense*. They were the same as those of Unknown III. Whether or not metabolite A and Unknown II are identical was not established. (Author abstract by permission)

72-2476. Hoagland, R. E.; Graf, G. (Dept. of Biochem., N. Dakota State Univ., Fargo, ND 58102). **Enzymatic hydrolysis of herbicides in plants.** *Weed Sci. 20(4): 303-304; 1972.* (7 references)

Nineteen different genera of weeds encompassing twelve plant families were surveyed for hydrolytic enzymes which were able to metabolize the amide bonds in several groups of herbicides. Propanil (3′,4′-dichloropropionanilide), 1,1-dimethyl-3-phenylurea (fenuron), and isopropyl carbanilate (propham) were employed as enzyme substrates, representing the amide, urea, and carbamate classes. Propanil was hydrolyzed at widely diverse rates by approximately 70% of the plants tested. Only one plant showed a hydrolysis of propham and fenuron. The study demonstrates a widespread distribution of hydrolytic enzymes capable of degrading the herbicide, propanil. An apparent lack of hydrolytic enzymes able to metabolize propham and fenuron was also noted. (Author abstract by permission)

72-2477. Hikino, H.; Ohizumi, Y.; Takemoto, T. (Pharmacol. Inst., Tohoku Univ., Sendai, Japan). **[Absorption, distribution, metabolism, and excretion of insect-metamorphosing hormone, ecdysterone, in mice.]** *Yakugaku Zasshi (J. Pharmaceut. Soc. Jap.) 92(8): 945-950; 1972.* (15 references)

[23,23,24,24-$^{3}H_4$]-Ecdysterone (ecdysone) was synthesized and administered intraperitoneally or perorally to male mice. Animals were killed by exsanguination at a predetermined time; radioactivity in organs, blood, and excreta was determined by liquid

scintillation spectrometry. The absorption of ecdysone was complete within 10 min after i.p. administration. Largest quantities were found in liver, followed by kidney and blood. Small quantities of ecdysone radioactivity were present in brain, lung, and heart. The activity had almost disappeared in all organs except brain by eight hr after administration. When ecdysone was administered perorally, absorption was much slower, reaching a maximum in the liver after one hr and in other organs and blood by eight hr after administration. The rate of disappearance from organs was also slower. In liver homogenate fractionation studies, more than 80% of the radioactivity was found in the supernatant fraction, indicating that affinity for the microsomal fraction was slight. For both administration routes, more ecdysone was found in feces than in urine, suggesting that the prinicpal excretion pathway is via liver into bile to intestine. According to thin-layer chromatography of radioactive substances in the liver, ecdysone was metabolized rather rapidly.

See also 72-2270 72-2286 72-2301 72-2322 72-2329 72-2341

72-2478. Chopra, N. M.; Domanski, J. D. (Dept. of Chem., North Carolina Agr. and Tech. State Univ., Greensboro, NC). **Systematic studies on the breakdown of *p,p'*-DDT in tobacco smokes. III. Isolation and identification of the non-volatile degradation products of *p,p'*-DDT in *p,p'*-DDT-treated tobacco smokes.** *Beitr. Tabakforsch. 6(3): 139-143; 1972.* (8 references)

Methodology is described for the determination of degradation products in smoke from tobacco sprayed with DDT. The treated tobacco was smoked in a Buchner funnel with its inner plate removed. A suction pump maintained an air flow of 4 l/min. Tobacco smoke was collected in a series of six traps, the first of which was empty and cooled to 0°C, while the remainder contained pentane and were cooled to -80°C. Extracts and solutions from the traps were collected, filtered, and heated to 60°C to remove the solvent. The residue was treated with cyclohexane saturated with methanol-water, extracted with methanol-water saturated with cyclohexane, evaporated to dryness, redissolved in hexane, extracted with acetonitrile, mixed with 2% aq NaCl, and again extracted with hexane saturated with acetonitrile. The resulting concentrate was repeatedly chromatographed on activated Florisil and deactivated alumina columns until the *p,p'*-DDT pyrolysis products were separated into individual components. The compounds were identified by chromatography and cochromatography with reference compounds. A 3% SE 30 glass column and a 3% OV-17 glass column were used, with electron capture and microcoulometric detectors. Compounds identified here were the same as those isolated from pyrolysis of *p,p'*-DDT in a nitrogen atmosphere, with the addition of *p,p'*-dichlorobenzophenone, and included *p,p'*-DDT, *p,p'*-DDE, *p,p'*-TDE, *p,p'*-DDM, *trans-p,p'*-dichlorostilbene, and bis-(*p*-chlorophenyl)methane.

72-2479. Shaw, M. J. P. (Tobacco Res. Bd. of Rhodesia, Salisbury, Rhodesia). **Pesticide residues in Rhodesian tobacco attributable to recommended pest control practices.** *Beitr. Tabakforsch. 6(3): 144-147; 1972.* (6 references)

The use of pesticides in tobacco growing in Rhodesia is currently controlled by voluntary adherence of growers to the Pesticide Approval Scheme of the Tobacco Research Board, but legislation has been introduced which will make the following of this scheme mandatory. Of the pesticides applied in the seedbed, the fumigants methyl bromide and DD/MITC leave no persistent residues in soil or cured leaf, nor do the copper and carbamate fungicides applied. The DDT applied to the seedlings results in appreciable soil accumulation, although apparently the tobacco plant takes up only negligible amounts of DDT. Aldrin and dieldrin are no longer applied to tobacco transplanted to the field, but considerable soil residues remain in some areas due to their use in prior years. Studies of dieldrin uptake by tobacco plants are underway. Application of Dinocap fungicides to tobacco leaf in the field can be anticipated to leave residues of less than 1 ppm at harvest. Monocrotophos is the insecticide most frequently applied to the leaf, and leaves residues of less than 0.5 ppm in cured leaf. The aphicides menazon, disulfoton, demeton-*s*-methyl, and dimethoate are used only rarely; they leave residues of < 5 ppm, trace, < 1 ppm, and $<$ 0.5 ppm respectively. Adjustment of planting times and breeding of disease-resistant varieties of tobacco have reduced the quantities of pesticides required.

72-2480. Murano, A.; Nagase, M. (Takarazuka Res. Lab., Sumitomo Chem. Ind. Co. Ltd., Takarazuka-shi, Japan). **[Determination of methomyl, *S*-methyl-*N*-((methyl-carbamoyl)oxy)-thioacetamidate, an insecticide.]** *Bunseki Kagaku (Japan Analyst) 21(6): 804-806; 1972.* (9 references) (Japanese)

In order to establish a quantitative analytical method of determining methomyl, an attempt was made to separate pure methomyl from impurities by TLC and to convert methomyl to its sulfoxide by oxidation with bromine. The method was as follows: one ml of chloroform solution containing about 12 mg of methomyl was treated on a silica gel plate and developed with a mixture of ether and acetone (19:1). The portion of the silica gel corresponding to the *Rf*-value of methomyl (about 0.4) was removed from the plate, and transferred to a 500 ml iodine flask. Thirty ml of glacial acetic acid and 30 ml of 0.02 *N* bromine solution were added and the reaction mixture was allowed to stand for 1 hr at room temperature in the dark. Twenty ml of 2 *N* sulfuric acid, 50 ml of water, and 10 ml of 20% aqueous potassium iodide solution were added to the mixture. The excess bromine replaced by iodine was titrated with 0.02 *N* aqueous sodium thiosulfate solution as soon as possible.

72-2481. Martin, E. A. (Univ. de Montreal, Fac. de Pharmacie, Montreal, Canada). **Dosage fluorometrique de quelques pesticides. [Fluorometric determination of some pesticides.]** *Can. J. Pharm. Sci. 7(1): 21-22; 1972.* (8 references) (French)

Hydrolysis of a non-fluorescent fluorescein ester (fluorescein dibutanoate) by lipase at pH 8 and 37°C was utilized in a new method for the quantitative determination of parathion, paraoxon, EPN, dicapthon, trithion (carbophenothion), methyl trithion, ronnel, and zytron. Maximum fluorescence was read on a spectrofluorometer at 470 nm excitation and 510 nm emission to determine the fluorescein liberated in the absence and in the presence of a certain pesticide. The difference between the two readings, or the percent inhibition of fluorescence development was proportional to the amount of lipase-inhibiting pesticide present. Calibration curves for the quantitative determination of the above compounds are reproduced. The sensitivity of the procedure ranges from 0.1 to 0.005 μg/ml after 2 to 6 min of hydrolysis under the above conditions, depending on the assayed compound.

72-2482. Dietz, A. A.; Rubinstein, H.; Lubrano, T. (Res. and Med. Serv., Veterans Admin. Hosp., Hines, IL 60141). **Detection of patients with low serum cholinesterase activity: inadequacy of "Acholest" method.** *Clin. Chem. 18(6): 565-566; 1972.* (17 references)

Patients with low serum cholinesterase activity present a risk of prolonged apnea after administration of the muscle relaxant succinylcholine in anesthetic management. Some laboratories have recently reported the use of the "Acholest" commercial test kit method in screening for serum cholesterase prior to surgery. The results of tests by this method were therefore compared with results of a generally accepted assay based on the Ellman reaction, using sera from healthy persons as well as from patients with hereditary cholinesterase variants. Of the 22 sera which fell below the lower limit of normal by the quantitative assay method, 12 were evaluated as normal by the Acholest method. Twenty of these were obtained from patients with hereditary cholinesterase variants which strongly predispose to prolonged apnea after succinylcholine. Therefore, the Acholest test is not suitable for use as a pre-anesthesia screening procedure.

72-2483. Ito, Y.; Otsuki, K.; Sekita, H.; Takeda, Y.; Takeda, M.; Tanabe, H. (Nat. Inst. Hyg. Sci., Tokyo, Japan). **[Studies on the analysis of pesticide residues in foods. II. Analysis of organo-chlorinated pesticide residues in dairy products.]** *Eisei Shikenjo Hokoku (Bull. Nat. Hyg. Sci.) 89: 29-33; 1971.* (2 references) (Japanese)

Methods of extracting and measuring the residues of organochlorines in various dairy products were examined and good results obtained. The method was applied to measuring the residues in domestic dairy products such as milk, modified powdered milk, skim milk, and butter. The modified powdered milk and skim milk were prepared so that the residues could be compared to those in normal milk. The protein content of all samples was made approximately 3%. The residues of α-, β-, δ-BHC, lindane, DDE, TDE, and DDT were detected by Florisil column chromatography. The dry method described in the FDA manual was modified and changed to a wet method. Residues were analyzed by gas chromatography with an electron capture detector (ECD). Four columns from the ECD gas chromatography were selected and examined. The results showed that average pesticide residues in dairy products on whole milk basis were 0.076 ppm of total BHC in milk, 0.016 ppm in modified milk, and 0.003 ppm in skim milk. But the amount of β-BHC in milk was as high as 0.132 ppm, and α-BHC was 0.057 ppm. Nominal amounts of DDD, DDE, and DDT were found in all the dairy products, and almost no traces of dieldrin and aldrin were detected.

72-2484. Otsuki, K.; Sekita, H.; Takeda, Y.; Ito, Y.; Takeda, M.; Tanabe, H.; Minagawa, O. (Nat. Inst. Hyg. Sci., Tokyo, Japan). **[Studies on the analysis of pesticide residues in foods. III. Activity of Florisil.]** *Eisei Shikenjo Hokoku (Bull. Nat. Hyg. Sci.) 89: 34-37; 1971.* (1 reference) (Japanese)

Passage over a Florisil column is a widely used method for cleanup of food extracts prior to organochlorine residue analysis by gas-liquid chromatography. The elution of organochlorines from Florisil columns was investigated, with particular reference to dieldrin because of its high affinity to Florisil. Dieldrin was not detected in the first 100 ml of *n*-hexane eluate from 5 g of Florisil activated for 24 hr at 450°C, but approximately 98% of the dieldrin was recovered in the next 500 ml. When 5 g of Florisil was deactivated with 5% and 10% water, dieldrin was quantitatively recovered in 450 ml and 200 ml of *n*-hexane respectively. Dieldrin was completely eluted from 5 g of Florisil with 200 ml of *n*-hexane containing 6% ethyl ether or 50 ml of *n*-hexane containing 15% ethyl ether. Aldrin and endrin were quantitatively recovered from a 20-g Florisil column with 200 ml of *n*-hexane containing 30% ethyl ether, whereas under these conditions, only 67% of the dieldrin was recovered. Washing the Florisil to remove any sulfates present had little effect on the recovery or organochlorines.

72-2485. Otsuki, K.; Sekita, H.; Takeda, Y.; Ito, Y.; Takeda, M.; Tanabe, H. (Nat. Inst. Hyg. Sci., Tokyo, Japan). **[Studies on the analysis of pesticide residues in foods. IV. Analytical method of organo-chlorinated pesticide residues in agricultural products.]** *Eisei Shikenjo Hokoku (Bull. Nat. Hyg. Sci.) 89: 38-42; 1971.* (Japanese)

The recovery rate of organochlorines was examined. The relationship between the recovery rate from Chinese cabbages and extraction frequency was measured by electron capture detector gas chromatography, using three 250 ml portions of *n*-hexane. The two initial extractions recovered 98.3% of added lindane, 98.1% of aldrin and 97.0% of *p,p'*-DDT. The effect of water on the extraction of organochlorines was examined using persimmons. Without water, recovery ranged from 18.5% for *p,p'*-DDT to a maximum of 40% for heptachlor. With the addition of 100 ml of distilled water, the recovery rate ranged from 70% for Kelthane (dicofol) to 88.9% for heptachlor. Recovery rates of organochlorines from 16 types of produce were also examined. The rates ranged from 68.4% (corn) to 97.1% (mandarin orange) for lindane; 72.9% (celery) to 99.3% (asparagus) for β-BHC; 77.6% (celery) to 100.8% (asparagus) for Kelthane; 66.4% (eggplant) and 94.1% (rice) for aldrin; 73.2% (eggplant) to 94.1% (wheat) for dieldrin; and 70.1% (turnip) to 90.4% (corn) for endrin.

72-2486. Levi, I.; Mazur, P. B.; Nowicki, T. W. (Grain Res. Lab., Canadian Grain Comm., Winnipeg, Manitoba, Canada R3B OT8). **Rapid screening method for the determination of organochlorine pesticide residues in wheat by electron capture gas chromatography.** *J. Ass. Offic. Anal. Chem. 55(4): 794-799; 1972.* (5 references)

A rapid screening method, employing a gas chromatographic technique with electron capture detection, has been developed for the analysis of organochlorine pesticide residues in hard red spring wheat. Ground wheat is extracted by ball-milling with an ethyl ether-hexane (3 + 97) extractant. After filtration, the extract is cleaned up on a partially deactivated Florisil column, using a single eluting system, ethyl ether-hexane (1 + 99). The eluate is concentrated before gas chromatographic analysis. Sixteen organochlorine pesticide chemicals were recovered in excess of 80% from wheat samples fortified at 0.010 and 0.200 ppm. Organochlorine pesticide residues were recovered by the rapid method from 18 samples with field-incurred residues as efficiently as by the Bertuzzi *et al.* method. Organochlorine pesticide residues were also recovered by the rapid method from four samples with field-incurred residues and from two wheat samples spiked at 0.500 ppm as efficiently as by the total extraction method of Mumma *et al.* The rapid method offers a savings in time and solvents over the Bertuzzi *et al.* method for the determination of organochlorine pesticide residues in wheat. (Author abstract by permission)

72-2487. Rangaswamy, J. R.; Majumder, S. K.; Poornima, P. (Central Food Technol. Res. Inst., Mysore-2(A), India). **Colorimetric method for estimation of methyl iodide residues on Jowar (sorghum) and rice.** *J. Ass. Offic. Anal. Chem. 55(4): 800-801; 1972.* (3 references)

A new colorimetric method based on the catalytic action of iodide on oxidation of As(III) by Ce(IV) has been developed for the estimation of methyl iodide residues on grains. Methyl iodide residues, in methanolic KOH, are converted to potassium iodide which acts as a catalyst in the timed oxidation of As(III) by Ce(IV). Unreduced ceric salt is measured colorimetrically and the iodide in the sample is calculated. The method is sensitive in the range 0.01 to 0.1 μg iodide. (Author abstract by permission)

72-2488. Adler, I. L.; Gordon, C. F.; Haines, L. D.; Wargo, J. P. (Res. Labs., Rohm and Haas Co., Bristol, PA 19007). **Determination of residues from herbicide *N*-(1,1-dimethylpropynyl)-3,5-dichlorobenzamide by electron capture gas-liquid chromatography.** *J. Ass. Offic. Anal. Chem. 55(4): 802-805; 1972.* (4 references)

Terminal residues of *N*-(1,1-dimethylpropynyl)-3,5-dichlorobenzamide and/or its metabolites are determined by digesting the sample with sulfuric acid and methanol to convert residues to methyl 3,5–dichlorobenzoate. This compound is codistilled from the reaction medium, purified by chromatography on Florisil, and measured by electron capture gas-liquid chromatography. The method is sensitive to 0.01 ppm. A decline pattern for residues on alfalfa is given. (Author abstract by permission)

72-2489. Smyth, R. J. (Customs Lab., Seaton, South Australia 5023). **Detection of hexachlorobenzene residues in dairy products, meat fat, and eggs.** *J. Ass. Offic. Anal. Chem. 55(4): 806-808; 1972.* **(6 references)**

A rapid, one column chromatographic method using deactivated Florisil for the cleanup of fatty foods is described. Hexachlorobenzene, which is only partially recovered by multiple residue methods, is recovered in excess of 80%, using the method described. A gas chromatographic column containing a mixture of DC-200 and QF-1 as stationary phase for the separation of hexachlorobenzene from *a*-benzene hexachloride is also described. (Author abstract by permission)

72-2490. Collins, G. B.; Holmes, D. C.; Wallen, M. (Lab. of the Govt. Chemist, Cornwall House, Stamford St., London, S.E.I., Great Britain). **Identification of hexachlorobenzene residues by gas-liquid chromatography.** *J. Chromatogr. 69(1): 198-200; 1972.* (6 references)

When hexachlorobenzene (HCB) is injected onto gas-liquid chromatography (GLC) columns which use nonpolar phases, the resultant peak usually coincides with either that of *a*-BHC or lindane. Only polar phases have been found effective in resolving HCB from these isomers. Since HCB has short retention times on the GLC columns, it was thought that a derivative with a higher molecular weight would be advantageous; it would be more likely to have a longer retention time and would not be masked by the injection peak made by the solvent. Pentachloroanisole and pentachlorophenyl propyl ether were tested. The latter was found to be well resolved from HCB and can be used as a means of identifying HCB residues at nanogram to microgram levels by GLC.

72-2491. McKone, C. E.; Hance, R. J. (Agr. Res. Counc., Weed Res. Org., Begbroke Hill, Yarnton, Oxford OX5IPF, Great Britain). **Determination of residues of 2,4,5-trichlorophenoxyacetic acid in soil by gas chromatography of the *n*-butyl ester.** *J. Chromatogr. 69(1): 204-206; 1972.* (9 references)

The method describes a gas chromatographic procedure employing the *n*-butyl ester for the determination of 2,4,5-T in soil. Soil samples are dehydrated with anhydrous sodium sulfate and extracted with diethyl ether-chloroform-glacial acetic acid (25:25:1). After settling, a 5ml aliquot of supernate is taken to dryness with air, at 35°C. Residues from soils fortified with esters are dissolved in 5ml of 2,2,4-trimethylpentane and aliquots taken for gas chromatography. Residues from

soil fortified with 2,4,5-T acid or from soils with unknown 2,4,5-T content are esterified with butanol. This material is then extracted into water and 2,2,4-trimethylpentane, and after separation of the phases, 5 μl are used for gas chromatography. The GC is done under the following conditions: Pye 104 GC with a ^{63}Ni detector; column, 1.5m X 4mm I.D. glass packed with 1.5% XE 60 on 80-100 mesh Chromosorb W,HP; injector temperature, 275°; column temperature, 195°; detector temperature, 280°; carrier gas flow, 60ml/min oxygen-free nitrogen. Standards were prepared from 2,4,5-T acid which was taken through the butylation procedure. Butyl ester residues were measured using standards prepared from pure 2,4,5-T butyl ester. Recoveries from 81.5-91.5% were obtained with the non-butylated and from 56-101% with the butylated soils. The method is applicable to soils containing both original and hydrolyzed esters.

72-2492. Masuda, Y.; Homma, N.; Shigeno, R. (Sch. of Legal Med., Fac. of Med., Niigata Univ, Niigata-shi, Japan). **[Determination of dipterex by gas-liquid chromatography.]** *Kagaku Keisatsu Kenkyusho Hokoku (Rep. Nat. Res. Inst. Police Sci. 25(1): 47-50; 1972.* (25 references) (Japanese)

Methods were studied to determine Dipterex (trichlorfon) through gas chromatography and to extract it with ethyl ether from aqueous solutions with various pHs. Dipterex could be detected using a gas chromatograph equipped with a hydrogen ionization detector and a glass column 185 cm X 3.0 mm i.d., temperature 150°C, packed with Chromosorb W (60-80 mesh), coated with 1.5% SE-30. In acidic solutions, the recovery rate of Dipterex was 90%. The least detectable amount seemed to be 1 μg. The method was applied on a case of suspected Dipterex poisoning and 131.5 mg determined in the stomach contents. Extractions were also successful under alkaline conditions. However, at pH 9 and pH 12, a strong peak appeared at retention time 1.7 min with a weaker peak of Dipterex. The alkaline peak appears to be DDVP (dichlorvos), derived from Dipterex under alkaline conditions.

72-2493. Kaye, S. (Sch. of Med., Univ. of Puerto Rico, Puerto Rico). **Rapid, simple, reliable tests for poisons.** *Lab. Med. 3(5): 28-30, 32-33, 35-41; 1972.* (17 references)

Parathion is the chemical most often used for suicide in Puerto Rico. It also occurs very frequently in accidental poisonings. Tests to determine its presence are given. The *p*-nitrophenol test is simpler and more reliable than the complicated cholinesterase test and very sensitive to small early exposure. It is performed on vomitus or gastric contents, which are steam distilled, and the distillate gently heated after the addition of sodium hydroxide. A yellow color indicates the presence of *p*-nitrophenol (a metabolite of parathion). Early dramatic remission of signs and symptoms under atropine therapy is another sensitive biologic test. Tests are described for the more common poisons including: salicylates, the alcohols, carbon monoxide, heavy metals, cyanide, barbiturates, phenothiazines, tricyclic antidepressants, quinine, lead, bromides, ferrous sulfate, sulfanilamides, kerosene, methemoglobin, and strychnine.

72-2494. Demaimay, M.; Lavoue, G.; Feuillat, M. (Lab. de Chimie et de Technol. Agricole, Ecole Nationale d'Ingenieurs des Travaux Agricoles de Quetigny (21), France). **Essai de dosage qualitatif et quantitatif de quelques pesticides organochlores dans les produits laitiers par l'utilisation d'une precolonne en chromatographie gaz-liquide. [Qualitative and quantitative determination of some organochlorine pesticides, occurring in dairy products, by utilizing a preliminary column in gas-liquid chromatography.]** *Lait 52(511-512): 43-54; 1972.* (5 references) (French)

A simplified method for the determination of organochlorines in milk and cheese samples is presented. Chromatography on Florisil is replaced by direct injection of the pesticide-carrying fatty extract (prepared according to the procedure developed by the U.S. FDA laboratories) into a column, referred to as preliminary and packed with Reoplex 400. The preliminary column (10 cm) retains the lipids specifically and is separated from the actual analytical column by a glass wool layer. The analytical column (1.8 m length and 3 mm i.d.) is packed with 5% QF-1. Chromatography is performed on an instrument equipped with two electron capture detectors, utilizing ^{63}Ni as an ionization source, and argon-methane (90/10 v/v) as the carrier gas (40 ml/min flow rate). The temperature of the column is kept at 210°C but can be varied in the 190-230°C range, under programmed temperature analysis conditions. Linear calibration curves are obtained with HCB, dieldrin, α-BHC, lindane, heptachlor epoxide, heptachlor, and aldrin, at concentrations ranging from 0.05 to 0.5 ppm. Retention coefficents for each compound are computed utilizing aldrin as a reference. Reproducible results are obtained on samples, analyzed after 15 days of storage at room temperature in the light. Additional data are required to provide statistical evidence as to the applicability of the procedure in routine industrial Q.C. analysis.

72-2495. Claeys, R. R.; Griffin, D. A. (Dept. of Agr. Chem., Oreg. State Univ., Environ. Health Sci. Cent., Corvallis, OR 97331). **Analytical services.** *Oreg. State Univ. Environ. Health Sci. Cent. Annu. Progr. Rep., 1972, 97-105.* (3 references)

Improvements in the electronic circuit and the use of open tubular columns and a potentiometric recorder reduced to 1/100 the amount of material needed for GC-MS identification of organochlorines and polychlorinated biphenyls (PCBs). Glass frit or single-stage silicone rubber membrane separators were utilized de-

pending on the compounds and conditions required. Stainless steel open tubular columns were found to be satisfactory for PCB and organochlorine analysis. The column flow rate should be adjusted to optimum and the temperature, length,and diameter selected to give the separation needed in a given time. With careful flow rate control, and sometimes addition of makeup gas at the GC outlet, electron capture detectors could be used at the flow rates required.

72-2496. Anonymous. **CSMA chemical analysis test methods.** *Soap, Cosmet., Chem. Spec. 48(4): 152,155-163; 1972.* (17 references)

The latest revisions of test methods by the Insecticide Chemical Analysis Committee of the Chemical Specialties Manufacturers Association are reported. Methods described include:analysis of DDT and/or methoxychlor, pyrethrins, and piperonyl butoxide in aerosol insecticides and measurement of several properties of the aerosols; a qualitative test for chlordane and a method for determining total chlorine in chlordane and in various chlordane preparations; determination of organically bound chlorine and of chlorine or bromine in organic compounds; qualitative tests for rapid identification of organochlorines in insecticide formulations; determination of *N,N*-diethyl-*meta*-toluamide in Delphene, of aldrin, dieldrin and endrin, and of dichlorvos; determination of 2,4-D; and dieldrin analysis in formulations by partition chromatography. Also included are procedures for obtaining solutions of dichlorvos, determinations of DDT in various formulations, and an IR determination of methyl parathion in formulations and technical products. Some of the methods are official, others tentative.

See also 72-2268 72-2302 72-2308 72-2313 72-2314 72-2315 72-2404 72-2453

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